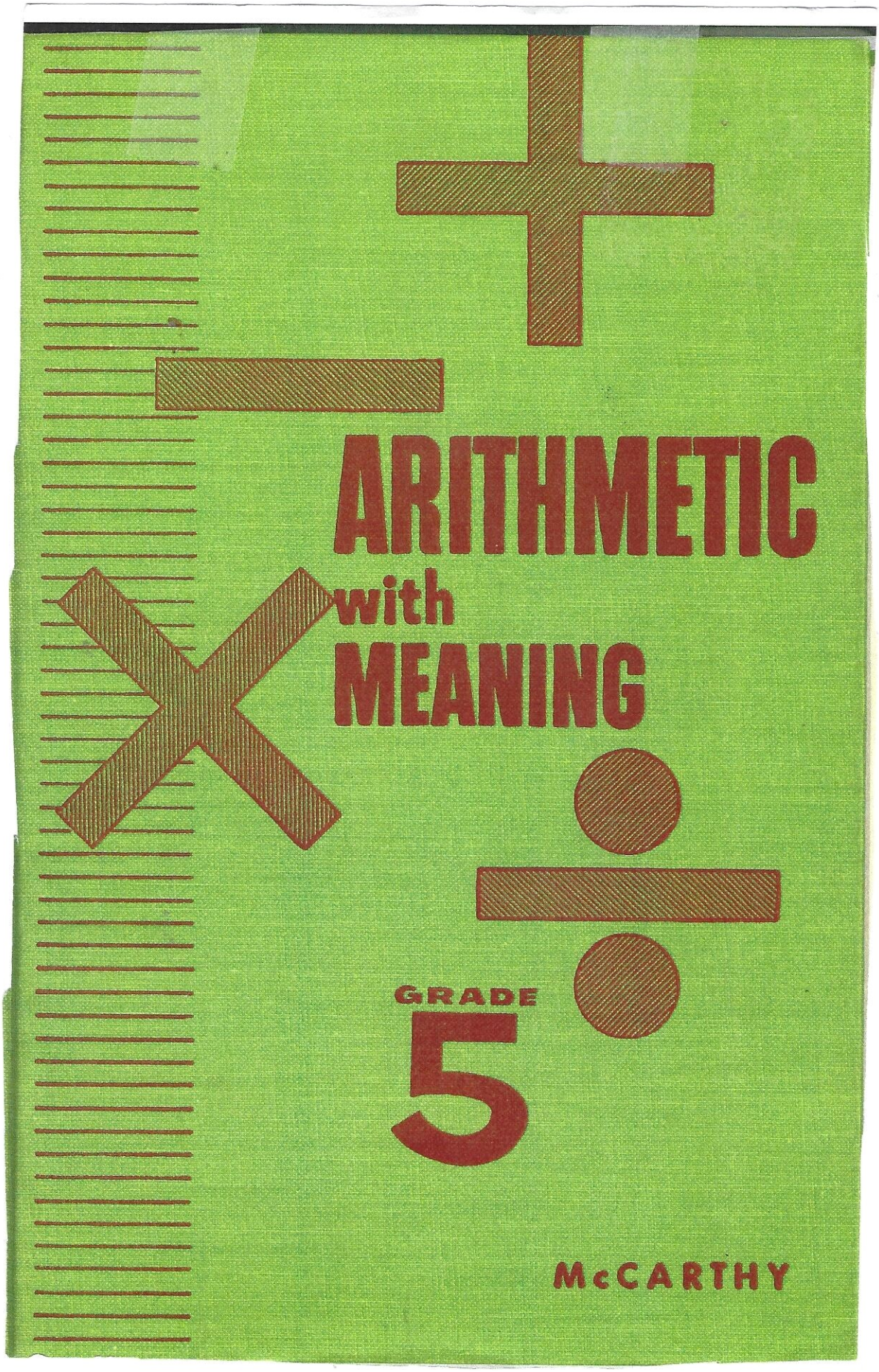
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Arithmetic *with* Meaning

GRADE 5

by

J. P. McCarthy, M.A., Ed.D.

Principal, Nova Scotia Teachers' College

Authorized for use in the schools of Nova Scotia and Prince Edward Island; approved for permissive use in the schools of Ontario

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SAVING TIME DOING ARITHMETIC

You can save a lot of time and get more practice in addition and subtraction if you do not copy the exercises from the text into your note-books or scribblers.

Hold a sheet of paper under the first row of exercises and write the answers on it. When you have finished the first row of answers, fold the answers under. Now hold the folded edge under the second row of exercises and write the answers. Fold these answers under and write the answers for the third row. Do the same for each other row. Be sure to write the number of each row before you write the answers.

If you fold paper as shown below you will save time in addition and subtraction.

1.	43	61	72	83	45	64	86
	32	23	54	33	92	64	41
1.	75	84	126	116	137	128	127

2.	57	94	78	154	63	182
	-31	-24	-42	-60	-29	-97
2.	26	70	36	94	34	85

IT PAYS TO SAVE TIME

SUCCESS

ALL ABOARD

Let's take a trip to SUCCESS on the Grade Five Arithmetic train. It will be fun if you have the right ticket and stay on the train. But no jumping off to explore other routes.

Below are some easy review questions. If you can do these, you will have a first-class ticket on the Grade Five Special. All aboard!

Look at the picture on the opposite page. See the train? It is the one Bill came in on today.

1. What time is it by the station clock? How much time has Bill to get to school if school begins at 9.00 a.m.?

2. One car on this train will seat 96 people. If there are 68 passengers in the car, how many seats are vacant?

3. If this train travels 40 mi. an hour, how long will it take to travel 120 mi.?

4. After the trip the conductor counted the tickets he had collected. He had 124 first-class tickets and 57 second-class tickets. How many tickets did he collect altogether?

5. If the train in the picture travels 234 miles on each trip, how many miles does it travel in 3 trips?

6. Bill's ticket on the train cost 15¢. How much change did he get if he gives the ticket seller 50¢?

7. If a train is due at a station at 9.15 a.m. and it is 3 hours late, what time will it be when the train arrives?

8. Bill and his friends watch a freight train go by. If it is 260 yd. long, how many feet long was it?

9. Bill's father is a railroad engineer. If he worked 5 days last week and earned $60.50, how much did he earn each day?

THE MEANING OF NUMBERS

If we are to understand what we are doing when we work with numbers, we must know what numbers *mean.*

What does 453 mean?

The right-hand figure, 3, means 3 *ones;* the next figure to the left, 5, means 5 *tens* or 50; and the 4 means 4 *hundreds* or 400.

Meaning of 453

3
50
400
453

The box on the left shows that the number 453 is made up of 4 hundreds, 5 tens, and 3 ones.

The number 453 is read: *four hundred fifty-three.* Do not use the word "and" in reading whole numbers.

Each figure in a number has a place value. Whole numbers start at the right with *ones* and extend to the left. Each place value is 10 times the place value to its right. The place value of *tens* is 10 times the place value of *ones;* the place value of *hundreds* is 10 times the place value of *tens,* etc.

What does 42675 mean?

Each figure in the number 42675 has a place name and value. Starting at the right, the first place is *ones.* How many ones in 42675? The next figure on the left is *tens.* How many tens in 42675? Below you see the names of the other places. Tell how many *hundreds, thousands* and *ten-thousands* there are in 42675.

Meaning of 42675

40000
2000
600
70
5
42675

ten-thousands	thousands	hundreds	tens	ones
4	2	6	7	5

42675 is read: *forty-two thousand, six hundred seventy-five.*
38062 is read: *thirty-eight thousand, sixty-two.*

THE MEANING OF VERY LARGE NUMBERS

One year Canada produced 19,425,638 tons of coal. What does 19,425,638 mean?

Each figure in the number 19,425,638 has a place name and value. Below you see the names of the places. Start at the right and tell what each figure in the number means.

ten millions	millions	hundred thousands	ten thousands	thousands	hundreds	tens	ones
1	9,	4	2	5,	6	3	8

Meaning of 19,425,638

10,000,000
9,000,000
400,000
20,000
5,000
600
30
8
19,425,638

It is easy to read large numbers if they are marked off by commas in groups of three from the right as shown above. Each group has a *name*. The names of the groups are shown below:

Millions' Group	Thousands' Group	Ones' Group
19,	425,	638

19,425,638 is read: *nineteen million, four hundred twenty-five thousand, six hundred thirty-eight.*

704,265 is read: *seven hundred four thousand, two hundred sixty-five.*

28,074 is read: *twenty-eight thousand, seventy-four.*

1. Tell what each figure in each of these numbers means: 13,426; 70,153; 426,317; 859,502; 2,136,794; 27,602,357; 15,249,381.

2. Read these numbers: 23,654; 60,251; 139,476; 784,309; 1,500,000; 6,750,000; 32,594,682; 25,160,000.

LEARNING ABOUT THINGS BY READING NUMBERS

To read intelligently, you must understand and be able to read the numbers you see in newspapers, magazines, and books. You can learn a lot from such sentences as those below which were taken from newspapers and books.

Read each sentence.

1. In Windsor 420 people had X-Rays taken last Thursday.

2. The Mackenzie River is 2,525 miles long.

3. The distance from Sydney to Vancouver by train is 3,930 miles.

4. There were 5,468 people at the hockey game.

5. The distance around the earth is 24,902 miles.

6. In a recent year 31,191 immigrants from the British Isles settled in Canada.

7. One of the largest crowds ever to see a baseball game was 82,000.

8. Over 200,000 different things are made from coal.

9. The distance from the earth to the moon is 238,857 miles.

10. Canada's newest province, Newfoundland, had a population of 321,819 when it joined the Dominion.

11. Each year Canada sells about 4,000,000 bushels of potatoes to the United States.

12. Electricity travels 11,160,000 miles in a minute.

13. The number of telephones in use in Canada shortly after the war was 1,748,320.

14. The distance from the earth to the sun is more than 92,000,000 miles.

15. One year recently the value of property lost by fire in Canada was $31,464,710.

SPECIAL WAYS OF READING NUMBERS

Numbers usually stand for *quantity* or *size*. The number tells us "how many" men, dollars, planes, etc., we are talking or reading about; or "how big", "how long", "how far" etc., something is.

They are also very often used to *identify* things. Telephone numbers, automobile license plates, box-car numbers, house numbers, bank book numbers, etc., are used to identify or "pick-out" the one we are talking about.

When numbers are used to identify things they *do not tell us anything about size or quantity*. A very large expensive automobile may have a small license plate number, and a very old and cheap second hand automobile may have a large license plate number. The license plate number merely identifies the automobile.

When numbers are used to identify things they are read in a *special way;* usually by saying the figures in order and by reading 0 as "oh".

The telephone number 3402 is read: *three-four-oh-two*. The automobile license plate number 5-32-41 is read: *five-three-two-four-one* or *five—thirty-two—forty-one*.

The house number 1536 is read: *one-five-three-six* or *fifteen—thirty-six*.

The year 1952 is usually read: *nineteen—fifty-two*.

The year 1706 is usually read: *seventeen—six* or *seventeen—oh—six*.

Read the sentences below.

1. John's telephone number is 309.

2. Mr. Peters reported to the police that his automobile, number 6-93-05, was stolen.

3. I live at 1024 Oakland Avenue.

4. When Frank was in the army, his number was 184231.

5. World War II began in 1939 and ended in 1945.

REVIEWING THE ADDITION FACTS

Here are the 81 addition facts you learned before. Study them by blocks. Also shown is addition with zero.

2 / 2 / 4	2 1 / 1 2 / 3 3	1 / 1 / 2	3 1 / 1 3 / 4 4	4 1 / 1 4 / 5 5	3 2 / 2 3 / 5 5	3 / 3 / 6
5 1 / 1 5 / 6 6	5 / 5 / 10	4 2 / 2 4 / 6 6	4 / 4 / 8	6 1 / 1 6 / 7 7	4 3 / 3 4 / 7 7	5 2 / 2 5 / 7 7
7 1 / 1 7 / 8 8	8 1 / 1 8 / 9 9	6 2 / 2 6 / 8 8	5 3 / 3 5 / 8 8	9 1 / 1 9 / 10 10	7 2 / 2 7 / 9 9	
8 2 / 2 8 / 10 10	6 3 / 3 6 / 9 9	5 4 / 4 5 / 9 9	7 3 / 3 7 / 10 10	6 4 / 4 6 / 10 10	6 / 6 / 12	
8 3 / 3 8 / 11 11	9 2 / 2 9 / 11 11	8 4 / 4 8 / 12 12	6 5 / 5 6 / 11 11	7 4 / 4 7 / 11 11	9 3 / 3 9 / 12 12	
7 / 7 / 14	8 / 8 / 16	7 5 / 5 7 / 12 12	9 4 / 4 9 / 13 13	8 5 / 5 8 / 13 13	9 / 9 / 18	8 6 / 6 8 / 14 14
9 5 / 5 9 / 14 14	7 6 / 6 7 / 13 13	8 7 / 7 8 / 15 15	9 6 / 6 9 / 15 15	9 7 / 7 9 / 16 16	9 8 / 8 9 / 17 17	

Addition with Zero

0 / 0 / 0	0 / 1 / 1	0 / 2 / 2	0 / 3 / 3	0 / 4 / 4	0 / 5 / 5	0 / 6 / 6	0 / 7 / 7	0 / 8 / 8	0 / 9 / 9
1 / 0 / 1	2 / 0 / 2	3 / 0 / 3	4 / 0 / 4	5 / 0 / 5	6 / 0 / 6	7 / 0 / 7	8 / 0 / 8	9 / 0 / 9	

When we put things together we ADD. The *sign* for addition is + and means *and* or *plus*. The answer in addition is called the *sum*.

ADDITION BY ENDINGS

If you know the addition facts it is easy to add a one-figure number to a two-figure number.

Look at the exercises on the right. They all belong to the "4 and 3 are 7" family. Each exercise has the same ending as 4.

$$\begin{array}{r} 4 \\ 3 \\ \hline 7 \end{array}$$

4	14	24	54	84
3	3	3	3	3
7	17	27	57	87

If you know that "4 and 3 are 7" you know all the other exercises.

When the sum of the ending is not greater than 9 the tens' figure in the sum is the same as the tens' figure in the two-figure number.

Give the sums quickly:

1.	32	26	15	43	54	33	62
	7	2	4	5	4	6	5
2.	30	64	56	35	12	77	81
	8	5	3	2	6	2	6

The exercises on the right belong to the "6 and 7 are 13" family because each has the same ending as 6 which is 6, 7, and 3.

$$\begin{array}{r} 6 \\ 7 \\ \hline 13 \end{array}$$

6	16	36	46	76
7	7	7	7	7
13	23	43	53	83

When the sum of the ending is more than 9 the tens' figure in the sum is *one more* than the tens' figure in the two-figure number.

Give the sums quickly:

3.	48	21	16	54	32	24	69
	4	9	8	9	8	7	5
4.	36	18	27	38	48	12	56
	6	8	7	7	6	9	9

THINGS TO REMEMBER WHEN ADDING

Here are some things to remember when adding. If you follow them you will be sure to get correct answers.

1. Make good clear figures.
2. Put the numbers to be added directly under each other in straight columns; the ones under the ones, the tens under the tens.
3. Start at the top and add down.
4. Do not count when adding.
5. Do not add by grouping 10's.
6. When adding skip the zeros and the blank spaces.
7. Add the carry number to the top figure in the next column immediately.
8. When adding dollars and cents put the decimal points directly under each other and put the decimal point in the answer directly under the decimal points above.
9. Check the addition by adding up. An exercise in arithmetic is never complete until it has been checked.

REVIEW PRACTICE IN ADDITION

Add. Check each answer.

1.

4	3	9	7	8	8	9	5
5	4	2	6	9	6	7	8
3	7	6	3	4	4	3	5
4	5	5	9	6	7	8	6
6	3	6	4	8	6	5	7
5	8	4	7	5	3	9	4

2.

3	5	6	8	9	8	6	9
8	4	7	4	5	7	9	8
5	6	6	3	8	6	7	6
4	4	2	8	4	3	4	5
3	5	5	4	9	9	8	8
6	8	6	7	6	8	7	6
5	3	7	8	4	7	5	6

3. $6+9+7+3+9+9$

4. $5+7+9+7+7+4+6$

PRACTICE IN ADDITION

Add. Check each answer.

1.

43	63	35	36	74	47	64
35	56	72	68	57	89	58
93	20	68	53	23	75	95
37	74	50	87	86	29	40
24	40	35	34	30	84	49
52	74	56	63	42	36	53

2.

234	617	570	376	695	826
906	502	643	544	366	602
493	424	401	775	830	294
250	308	880	389	542	853
802	930	542	232	277	570
210	304	301	687	620	128

3.

606	488	62	54	95	564
46	627	970	909	856	78
482	70	66	32	579	657
330	242	430	679	60	403
89	499	609	54	467	27
550	74	82	505	98	830

4.

3775	7949	5634	8745	9984
8362	5067	8503	5297	7086
2634	7503	4060	6804	7330
9070	2685	7879	8670	3602
6503	7350	6502	5028	5380
3934	9995	9790	7506	6846

5.

$3.53	$2.56	$91.86	$ 8.69	$ .84
4.04	9.87	82.07	77.07	6.09
6.80	4.66	60.65	6.53	79.40
3.45	6.00	53.90	25.86	4.78
9.06	2.44	80.47	78.07	.76
2.70	5.75	66.30	5.48	65.45

PROBLEMS USING ADDITION

1. Nina spent 47¢ for tooth paste and 9¢ for a spool of thread. How much did she spend altogether?

2. The Grade V class was collecting magazines for the patients in the hospital. Joe brought 8 magazines, Lee brought 6, Sam brought 9, and Peter brought 7. How many magazines did these boys collect altogether?

3. Tony is a newsboy. He earned $.51 on Monday; $.43 on Tuesday; $.64 on Wednesday; $.49 on Thursday; $.56 on Friday; and $.75 on Saturday. How much did he earn that week?

4. Mr. Gregg, the letter carrier, delivered 742 letters on Monday; 694 letters on Tuesday; and 589 letters on Wednesday. How many did he deliver in the three days?

5. When school started this year, Jack's father bought him some new clothes. He paid $6.75 for a pair of shoes; $1.65 for a shirt; $.79 for a tie; and $8.50 for a coat. How much did these cost?

6. There are 4 schools in Littletown. There are 176 pupils in Green St. School; 264 pupils in Brown St. School; 309 pupils in White St. School; and 189 pupils in the High School. How many pupils are there in the Littletown schools?

7. At the last hockey game there were 943 men, 375 women, and 86 boys. How many persons saw the game?

8. Tom Flynn, the milkman, delivered 342 quarts of milk on Monday; 367 quarts on Tuesday; 297 quarts on Wednesday; 287 quarts on Thursday; and 389 quarts on Friday. How many quarts did he deliver in the 5 days?

9. Paul ran a small canteen for tourists last summer. He made $74.63 in June; $89.65 in July; and $134.29 in August. How much did he make during the summer?

KEEPING THE TOOLS SHARP

Add. Check each answer.

1.

54	42	75	23	46	58	33
62	57	34	77	82	45	89
43	34	63	42	58	73	45
55	96	80	36	60	47	77
76	30	32	55	52	96	97
42	21	70	47	61	55	62

2.

322	805	914	653	815	526
453	363	283	706	709	647
205	250	807	442	527	291
566	931	595	970	143	940
706	380	728	604	388	473
433	849	806	790	708	352

3.

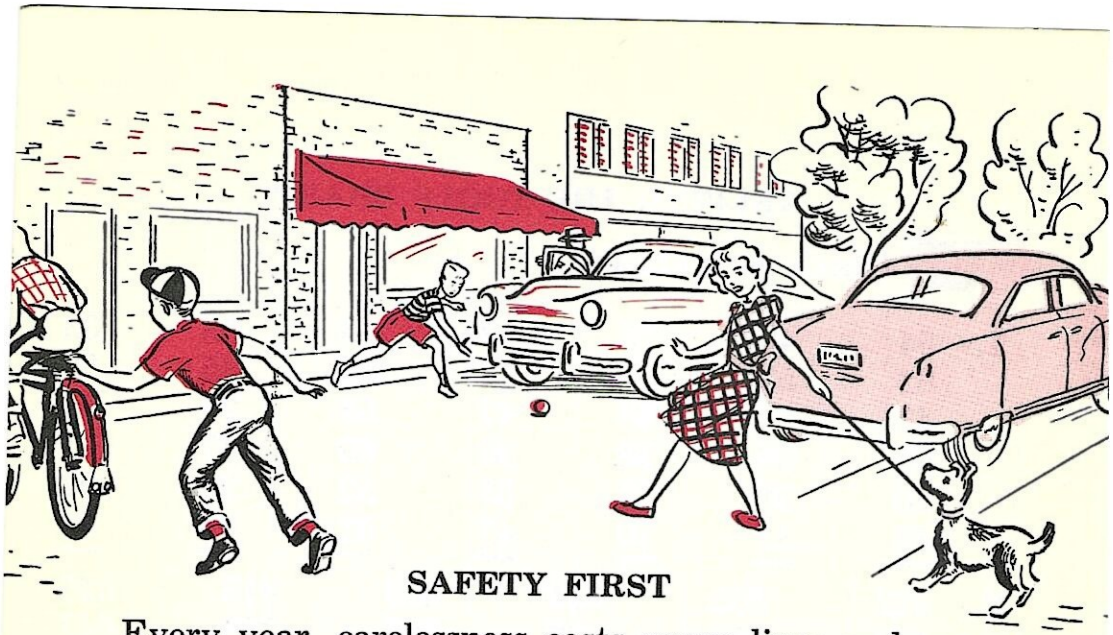
984	259	36	46	218	663
17	588	776	409	969	788
705	24	604	25	51	55
81	466	10	784	40	86
230	22	398	57	638	681
343	850	52	523	772	350

4.

2306	5317	9605	7459	8675
7683	7898	3719	3963	2508
4464	6020	7485	4805	8293
8077	4372	3063	8190	6709
6110	8957	9698	6773	9420
2305	7580	8072	4630	5982

5.

$.44	$5.87	$69.28	$ 9.39	$ 8.77
.92	7.05	26.56	8.84	.54
.60	9.97	84.05	64.07	35.49
.76	7.62	52.80	9.60	2.63
.43	4.10	86.34	85.51	.50
.75	5.64	42.08	3.69	87.92



SAFETY FIRST

Every year, carelessness costs many lives and many serious injuries. Before crossing a street or a road, look carefully in both directions to see that the way is clear. Just look at those children in the picture above! What are they doing that is wrong?

1. In a recent year in Canada, there were 1358 automobile accidents which caused deaths, 21175 automobile accidents which caused injuries to persons, and 26924 automobile accidents which caused damage to property only. How many automobile accidents were there altogether in Canada that year?

2. In a single recent year, automobile accidents caused death to the following: pedestrians, 658; motorcycle drivers, 32; automobile drivers, 295; automobile passengers, 492; bicycle riders, 123; and persons in horse drawn vehicles, 11. How many deaths were caused by automobile accidents in that year?

3. Harry borrowed his father's car and took some of his friends for a drive. Due to carelessness in not driving on his own side of the road, he hit a truck. The damage to the truck cost $42.75; to Harry's father's car, $97.60; and doctor's bills for cuts and bruises amouted to $12.00. How much did this accident cost?

Be careful on holidays. More cars are on the road.

MEASURING LENGTH

When we want to know "how long" anything is we use a measure of length. The measures or units of length you learned last year are the *inch*, the *foot*, the *yard*, and the *mile*. Not only do we measure *length* with the units of length; we measure *height*, *depth*, *thickness*, *width*, and *distance*—all of which have length.

1. Tell which unit of length you would use to measure: the width of this page; the length of your school room; the thickness of a brick; the height of a door; the distance from your home to the nearest town.

2. Draw in your scribbler a line which you think is 7 in. long. Now measure it. How close were you to being correct?

3. How long do you think your desk is? Measure it. How close were you to being correct?

4. Estimate how long your class room is. Measure it. How close were you to being correct?

5. Sometime today put in some practice in estimating distances and then measuring them to see how nearly correct you were.

6. The *mile* is the longest unit of length. Name two places in your community that are a mile apart.

7. How long does it take you to walk a mile? Discuss this with your teacher.

8. Memorize this table. Note carefully the abbreviations.

12 inches (in.)	=	**1 foot (ft.)**
3 feet (ft.)	=	**1 yard (yd.)**
36 inches (in.)	=	**1 yard (yd.)**
5280 feet (ft.)	=	**1 mile (mi.)**
1760 yards (yd.)	=	**1 mile (mi.)**

REVIEWING THE SUBTRACTION FACTS

Here are the 81 subtraction facts you learned before. Study them by blocks. Also shown is subtraction with zero.

4 − 2 = 2	3 − 1 = 2	3 − 2 = 1	2 − 1 = 1	4 − 1 = 3	4 − 3 = 1	5 − 1 = 4
5 − 4 = 1	5 − 2 = 3	5 − 3 = 2	6 − 3 = 3	6 − 1 = 5	6 − 5 = 1	10 − 5 = 5
6 − 2 = 4	6 − 4 = 2	8 − 4 = 4	7 − 1 = 6	7 − 6 = 1	7 − 3 = 4	7 − 4 = 3
7 − 2 = 5	7 − 5 = 2	8 − 1 = 7	8 − 7 = 1	9 − 1 = 8	9 − 8 = 1	8 − 2 = 6
8 − 6 = 2	8 − 3 = 5	8 − 5 = 3	10 − 1 = 9	10 − 9 = 1	9 − 2 = 7	9 − 7 = 2
10 − 2 = 8	10 − 8 = 2	9 − 3 = 6	9 − 6 = 3	9 − 4 = 5	9 − 5 = 4	10 − 3 = 7
10 − 7 = 3	10 − 4 = 6	10 − 6 = 4	12 − 6 = 6	11 − 3 = 8	11 − 8 = 3	11 − 2 = 9
11 − 9 = 2	12 − 4 = 8	12 − 8 = 4	11 − 5 = 6	11 − 6 = 5	11 − 4 = 7	11 − 7 = 4
12 − 3 = 9	12 − 9 = 3	14 − 7 = 7	16 − 8 = 8	12 − 5 = 7	12 − 7 = 5	13 − 4 = 9
13 − 9 = 4	13 − 5 = 8	13 − 8 = 5	18 − 9 = 9	14 − 6 = 8	14 − 8 = 6	14 − 5 = 9
14 − 9 = 5	13 − 6 = 7	13 − 7 = 6	15 − 7 = 8	15 − 8 = 7	15 − 6 = 9	15 − 9 = 6
16 − 7 = 9	16 − 9 = 7	17 − 8 = 9	17 − 9 = 8			

Subtraction with Zero

0 − 0 = 0	1 − 0 = 1	2 − 0 = 2	3 − 0 = 3	4 − 0 = 4	5 − 0 = 5	6 − 0 = 6	7 − 0 = 7	8 − 0 = 8	9 − 0 = 9
1 − 1 = 0	2 − 2 = 0	3 − 3 = 0	4 − 4 = 0	5 − 5 = 0	6 − 6 = 0	7 − 7 = 0	8 − 8 = 0	9 − 9 = 0	

REVIEWING WHAT WE LEARNED ABOUT SUBTRACTION

When we "*take-away*" a smaller number from a larger number we SUBTRACT.

The sign for subtraction is (−) which means, *take-away*, or *minus* or *less*.

Look at the example below:

```
 541 <--- minuend
-282 <--- subtrahend
 259 <--- difference
```

The number from which we subtract is the *minuend*. The number we subtract is the *subtrahend*. The answer in subtraction is the *difference or remainder*.

Explain how to get the answer to the example above. Tell what really happens when we borrow in subtraction.

```
 142 <--- minuend
 -67 <--- subtrahend
  75 <--- difference

Check
  67 <--- subtrahend
  75 <--- difference
 142 <--- minuend
```

CHECKING SUBTRACTION

To **check** subtraction add the *subtrahend* and the *difference*. If the sum is the same as the *minuend*, the subtraction is correct.

THINGS TO REMEMBER WHEN SUBTRACTING

1. Make good clear figures.
2. Write the numbers so that the ones' figure in the subtrahend is directly under the ones' figure in the minuend; the same with the tens' figures, hundreds' figures, etc.
3. Borrow when the figure in the minuend is smaller than the figure below it in the subtrahend.
4. The figure from which you borrow will be one less than it was before you borrowed.
5. When subtracting dollars and cents put the decimal points directly under each other and put the decimal point in the answer directly under the decimal point above.
6. Check every exercise in subtraction.

Remember that the only kind of answer that is any good in arithmetic is an absolutely correct answer.

PRACTICE IN SUBTRACTION

Subtract. Check each answer.

1.	856 453	792 260	984 504	375 342	689 652	746 704
2.	82 36	64 48	75 27	51 39	33 25	46 39	97 88
3.	783 617	952 524	591 125	845 716	743 729	166 158
4.	629 273	746 471	913 163	436 280	327 257	516 445
5.	531 252	824 345	952 593	745 356	561 188	853 254
6.	682 296	525 339	841 676	736 537	464 178	823 467
7.	973 685	645 487	732 294	661 597	497 399	551 475
8.	134 85	183 96	125 87	146 79	172 83	174 78
9.	326 41	467 75	235 40	592 97	725 69	563 87
10.	$9.88 4.59	$8.49 5.57	$6.27 3.28	$9.42 8.91	$6.41 1.69	$1.35 .88

SUBTRACTING LARGER NUMBERS

Subtract. Check each answer.

1.	1162 625	1454 708	1381 537	1245 939	1893 956
2.	1525 863	1723 940	1518 692	1635 745	1919 952
3.	1432 573	1374 896	1231 852	1664 695	1245 866
4.	9735 5897	6452 3585	5323 2597	4341 1676	9648 2859
5.	56735 28565	79462 16833	61443 30538	56452 19270	95782 63877
6.	14361 12615	72814 63640	62312 58092	37375 31438	84719 79045
7.	94525 53763	35741 28458	83264 30470	97236 34589	15734 10849
8.	96861 85982	64642 28769	62634 53759	53292 39798	59641 14966
9.	\$16.86 9.07	\$12.37 7.97	\$13.51 8.73	\$57.37 39.78	
10.	\$415.48 134.93	\$713.56 630.59	\$236.83 142.89	\$533.61 294.68	

WATCH THE ZEROS IN THE MINUEND

1. Subtract 245 from 402.

We cannot take 5 ones from 2 ones. We cannot borrow from the tens because there are 0 tens. Borrow 1 hundred from the 4 hundreds which leaves 3 hundreds. Change the 1 hundred to 10 tens. Now we can borrow 1 ten from the 10 tens and change 1 ten to 10 ones which with the 2 ones gives 12 ones. Since we borrowed 1 ten there are 9 tens left.

402
245
157

Now, there is a short way to get the answer: Think of the 2 as 12, of the 0 as 9, of the 4 as 3 and subtract.

2. Subtract 2473 from 3000.

We cannot take 3 ones from 0 ones. We cannot borrow from the tens or hundreds because there are no tens and no hundreds. Borrow 1 thousand from the 3 thousands. Change the 1 thousand to 10 hundreds. Borrow 1 of the hundreds from the 10 hundreds and change it to 10 tens. Since we borrowed 1 hundred there are 9 hundreds left. Borrow 1 ten and change it to 10 ones. Since we borrowed 1 ten there will be 9 tens left.

3000
2473
527

Think of the 0 in the ones' place as 10, of the 0 in the tens' place as 9 and of the 0 in the hundreds' place as 9, and of the 3 as 2, and subtract.

3. Subtract 2476 from 7052.

Explain as in exercises 1 and 2 above how to subtract 2476 from 7052, and then use the short way by thinking, $12-6=6$; $14-7=7$; $9-4=5$; and $6-2=4$.

7052
2476
4576

4. Subtract 1238 from 5065.

Explain as in the exercises above how to subtract 1238 from 5065. Tell why you must think of the zero in the minuend, 5065, as 10.

5065
1238
3827

5. Subtract 174 from 413.

In this exercise there will be a 0 in the tens' place in the minuend after you borrow from the tens' place. Borrow 1 hundred from the 4 hundreds and change it to 10 tens. Then subtract as in the exercises above.

413
174
239

WATCHING THE ZEROS IN THE MINUEND

Subtraction, when there are zeros in the minuend, can cause trouble unless you are careful. When you understand clearly the work on page 18 do the exercises below for practice.

Subtract. Check each answer.

1.	70 32	60 45	50 31	90 48	80 33	50 47	70 64
2.	600 216	700 445	900 593	800 531	300 269	500 452	
3.	805 260	607 134	504 276	401 145	802 618	907 858	
4.	500 320	900 606	600 409	300 107	400 304	200 101	
5.	416 218	612 436	817 258	511 225	715 389	913 547	
6.	\$15.80 6.92	\$18.30 9.97	\$12.00 3.28	\$14.00 4.94	\$13.00 7.83		
7.	3000 1341	5000 1513	7000 3625	6000 5329	9000 756		
8.	6502 4748	7030 4194	8060 3568	8101 7079	6101 1007		
9.	15303 5488	14030 7976	17018 9265	50004 1536			
10.	\$760.30 180.34	\$805.03 206.05	\$320.71 260.79	\$474.00 425.56			

PROBLEMS USING SUBTRACTION

1. Margie had $8.42 in her bank. She took $2.85 out of it to buy a blouse. How much had she left?

2. Frank and Norman collect stamps. Frank has 351 stamps and Norman has 273. How many fewer stamps has Norman than Frank?

3. Sally and her father went on an automobile trip. The first day they drove 260 miles and on the second day they drove 179 miles. How much farther did they drive on the first day than on the second day?

4. If a barrel of salt weighs 300 pounds and a barrel of flour weighs 196 pounds, how much heavier is the salt than the flour?

5. The population of Jimtown is 4372. Ten years ago the population was 2906. How much greater is the population of Jimtown now?

6. When the Smiths left on their vacation last summer the speedometer on their car read 7364 miles. When they got home again the speedometer read 8433 miles. How many miles did they drive?

7. Mrs. Daniels went shopping for a washing machine. One she looked at was priced $186.50; another was priced $168.75. What was the difference in the prices of the two machines?

8. Bobby's father weighs 206 pounds and Bobby weighs 97 pounds. How many pounds lighter is Bobby than his father?

9. Tom is saving his money to buy a $20.00 winter coat. He has saved $14.25 already. How much more must he save before he can pay for the coat?

10. Mr. Gill paid $4650 for a house. Sometime later he sold it for $5500. For how much more did he sell the house than he paid for it?

MILKMAN GROCER HOUSEWIFE

LIQUID MEASURES

Liquids are measured by the *cup*, the *pint*, the *quart*, and the *gallon*. You should have these measures in your classroom for this lesson.

1. Who is using the cup measure in the picture above? Name as many liquids as you can which are measured by the cup.

2. What measures is the milkman carrying in the picture? Name as many liquids as you can which are bought by these measures.

3. In the picture the grocer has filled the jug with vinegar. How much does it hold? Name as many liquids as you can which are measured by this measure.

4. Use the liquid measures you have in the classroom and water to find: how many cups in a pint; how many pints in a quart; how many quarts in a gallon.

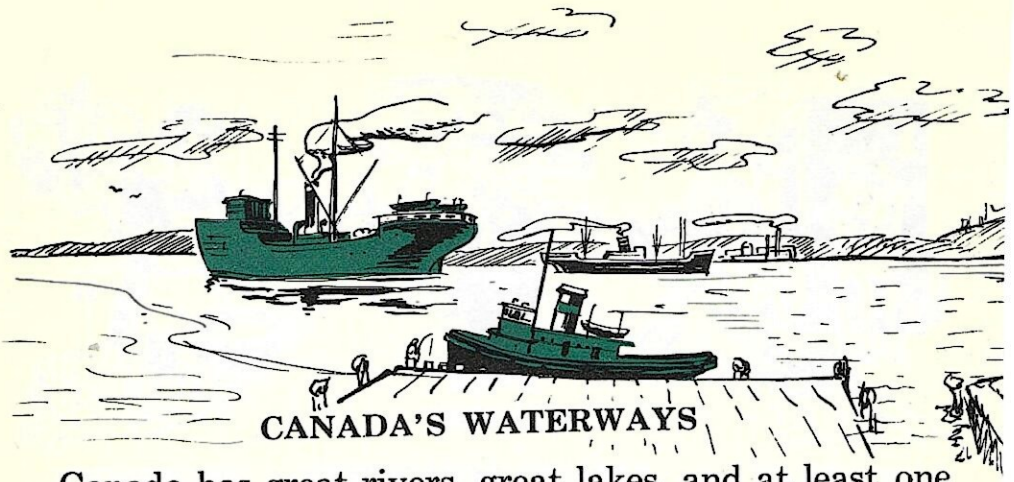
5. Memorize this table. Note the abbreviations.

2½ standard measuring cups	=	**1 imperial pint (pt.)**
(2 standard measuring cups	=	**1 U.S. pint)**
2 pints (pt.)	=	**1 quart (qt.)**
4 quarts (qt.)	=	**1 gallon (gal.)**

6. If Mr. Nelson's cow gives 5 gallons of milk a day, how many quarts of milk does she give a day?

7. Which is the better bargain: a quart of milk at 16¢, or 2 pints of milk at 9¢ a pint?

*As now defined by Standards Division, Department of Trade and Commerce, Ottawa, by authority of Order in Council, P.C. 1957-340 of March 14, 1957.



CANADA'S WATERWAYS

Canada has great rivers, great lakes, and at least one of the greatest water-falls in the world. Our rivers and lakes are most valuable for our trade and the water-falls are important sources of electric power.

Six of Canada's great rivers and their lengths are shown below.

Mackenzie	2525 mi.	Saskatchewan	1205 mi.
St. Lawrence	1900 mi.	Ottawa	685 mi.
Nelson	1660 mi.	St. John	390 mi.

1. How much longer is the Mackenzie River than the St. Lawrence River?

2. How much shorter is the Ottawa River than the Nelson River?

3. How many miles longer is the Saskatchewan River than the St. John River?

4. The longest river in the world is the Yangtze River in China which is 3100 mi. long. How many miles longer is it than the Mackenzie River?

5. Lake Superior is the largest fresh water lake in the world. It is 390 mi. long and 160 mi. wide. How many miles longer is it than it is wide?

6. Niagara Falls is 167 ft. high. Grand Falls in Labrador is 302 ft. high. How much higher is Grand Falls than Niagara Falls?

REVIEWING THE MULTIPLICATION FACTS

Here are the 64 multiplication facts you learned before. Study them by blocks. Also shown are multiplication with one and multiplication with zero.

2 ×2 = 4	2 ×5 = 10 5 ×2 = 10	3 ×2 = 6 2 ×3 = 6	4 ×2 = 8 2 ×4 = 8	6 ×2 = 12 2 ×6 = 12	7 ×2 = 14 2 ×7 = 14
9 ×2 = 18 2 ×9 = 18	8 ×2 = 16 2 ×8 = 16	5 ×3 = 15 3 ×5 = 15	5 ×5 = 25	5 ×4 = 20 4 ×5 = 20	6 ×5 = 30 5 ×6 = 30
7 ×5 = 35 5 ×7 = 35	8 ×5 = 40 5 ×8 = 40	9 ×5 = 45 5 ×9 = 45	3 ×3 = 9	6 ×3 = 18 3 ×6 = 18	4 ×3 = 12 3 ×4 = 12
8 ×3 = 24 3 ×8 = 24	7 ×3 = 21 3 ×7 = 21	9 ×3 = 27 3 ×9 = 27	4 ×4 = 16	7 ×4 = 28 4 ×7 = 28	6 ×4 = 24 4 ×6 = 24
9 ×4 = 36 4 ×9 = 36	8 ×4 = 32 4 ×8 = 32	6 ×6 = 36	8 ×6 = 48 6 ×8 = 48	7 ×6 = 42 6 ×7 = 42	9 ×6 = 54 6 ×9 = 54
7 ×7 = 49	9 ×7 = 63 7 ×9 = 63	8 ×7 = 56 7 ×8 = 56	8 ×8 = 64	9 ×9 = 81	9 ×8 = 72 8 ×9 = 72

The Multiplication Facts with One

1 ×1 = 1	1 ×2 = 2	1 ×3 = 3	1 ×4 = 4	1 ×5 = 5	1 ×6 = 6	1 ×7 = 7	1 ×8 = 8	1 ×9 = 9
2 ×1 = 2	3 ×1 = 3	4 ×1 = 4	5 ×1 = 5	6 ×1 = 6	7 ×1 = 7	8 ×1 = 8	9 ×1 = 9	

Zero Multiplied by Any Number Gives Zero

0 ×1 = 0	0 ×2 = 0	0 ×3 = 0	0 ×4 = 0	0 ×5 = 0	0 ×6 = 0	0 ×7 = 0	0 ×8 = 0	0 ×9 = 0

REVIEWING WHAT WE LEARNED ABOUT MULTIPLICATION

Multiplication is a short way of adding numbers that are the same.

$4 \times 7 = 28$ or $\begin{array}{r} 7 \\ \times 4 \\ \hline 28 \end{array}$ is a short way of finding, $7+7+7+7=28$.

$\begin{array}{r} 35 \\ \times 3 \\ \hline 105 \end{array}$ is a short way of finding, $35+35+35=105$.

The sign for multiplication is $\times$. It is read *multiplied by* or *times*.

Look at the example on the right.

35	← multiplicand
×3	← multiplier
105	← product

The number which is multiplied is the *multiplicand*. The number by which we multiply is the *multiplier*. The answer in multiplication is the *product*.

Explain how to get the answer to the example above. Tell what really happens when we *carry* in multiplication.

THINGS TO REMEMBER WHEN MULTIPLYING

1. Make good clear figures.
2. Start at the right and multiply the ones, then the tens, then the hundreds, etc.
3. Write the product figures so that the ones are under the ones, the tens under the tens, etc. A good way to make sure of this is to *write the first figure of a product or partial product directly under the figure by which you multiply.*
4. When you carry in multiplication, multiply first and then add the carry number.
5. Zero multiplied by any number is zero.
6. When multiplying dollars and cents put a decimal point in the product two places from the right to separate the dollars and cents.
7. Check the multiplication by doing the multiplication over again.

GETTING READY FOR MULTIPLICATION WITH CARRYING

When you carry in multiplication remember to *multiply first and then add the carry number.* The exercises below will give you practice for carrying in multiplication.

Read the first exercise this way: "4 7's are 28 and 3 are 31." Give the answers orally.

1.	$4\times7+3$	$5\times6+2$	$3\times9+1$
2.	$6\times8+4$	$8\times4+3$	$7\times6+4$
3.	$9\times4+5$	$6\times6+2$	$5\times8+3$
4.	$8\times9+4$	$7\times8+5$	$6\times9+2$
5.	$4\times6+3$	$9\times7+3$	$8\times7+4$
6.	$5\times9+2$	$4\times9+1$	$7\times7+2$
7.	$9\times8+3$	$8\times8+4$	$9\times6+3$

CARRYING IN MULTIPLICATION

Multiply. Check each answer.

1.	23 ×4	13 ×6	14 ×5	12 ×8	14 ×7	16 ×6	13 ×7
2.	67 ×5	28 ×7	84 ×6	76 ×9	96 ×4	59 ×8	49 ×9
3.	524 ×4	715 ×6	819 ×5	641 ×8	381 ×9	972 ×3	
4.	253 ×5	468 ×3	567 ×7	748 ×4	652 ×9	296 ×6	
5.	\$3.78 ×8	\$7.49 ×7	\$8.97 ×6	\$4.83 ×9	\$6.97 ×5	\$5.94 ×8	
6.	7162 ×4	1524 ×3	4518 ×5	6141 ×7	8612 ×8		
7.	2748 ×6	6893 ×5	3829 ×7	5792 ×9	3769 ×8		

WATCH OUT WHEN MULTIPLYING ZEROS

Remember: **Zero multiplied by any number is zero.**
Remember also: **Any number added to zero gives the number.**

Hence: $\begin{array}{r} 0 \\ \times 7 \\ \hline 0 \end{array}$ BUT $\begin{array}{r} 0 \\ +7 \\ \hline 7 \end{array}$

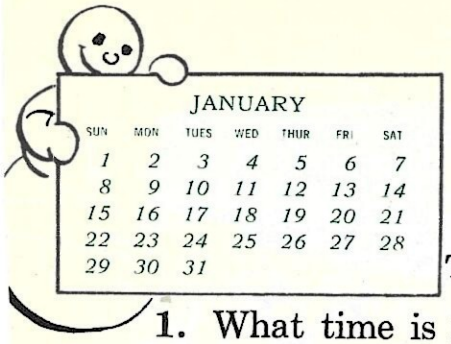
In multiplying you often have to add a carry number after you multiply a zero. Be careful here.

The exercises below will get you ready for exercises in which you may have to add a carry number after multiplying a zero. Multiply first and then add. Read the first exercise this way: "3 0's are 0 and 2 are 2".

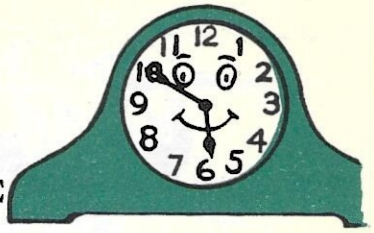
1.	$3\times0+2$	$5\times0+3$	$6\times0+3$
2.	$4\times0+1$	$9\times0+5$	$7\times0+2$
3.	$8\times0+6$	$6\times0+4$	$5\times0+1$

Multiply. Check each answer.

1.	530 ×3	620 ×4	700 ×5	400 ×8	904 ×2	802 ×3
2.	403 ×4	704 ×6	805 ×5	406 ×7	709 ×3	907 ×8
3.	806 ×9	509 ×7	305 ×6	806 ×8	207 ×7	509 ×9
4.	5009 ×5	3008 ×7	4003 ×9	3005 ×8	8009 ×6	
5.	6040 ×3	2060 ×6	9040 ×5	1060 ×7	2070 ×9	
6.	\$5.70 ×7	\$8.03 ×3	\$4.07 ×6	\$2.09 ×8	\$80.04 ×7	\$50.60 ×9



TELLING TIME



1. What time is it by the clock above? Tell how you know.

2. How many hours are there in a day?

3. How many hours are there from midnight to noon? from noon to midnight? How many times "around the clock" in a day?

4. School begins at 9.00 a.m. What does a.m. mean?

5. School lets out at 3.15 p.m. What time is that? What does p.m. mean?

6. What part of an hour is 30 min.? 15 min.? 45 min.?

7. How many seconds are there in 2 minutes?

8. Name the days of the week in order.

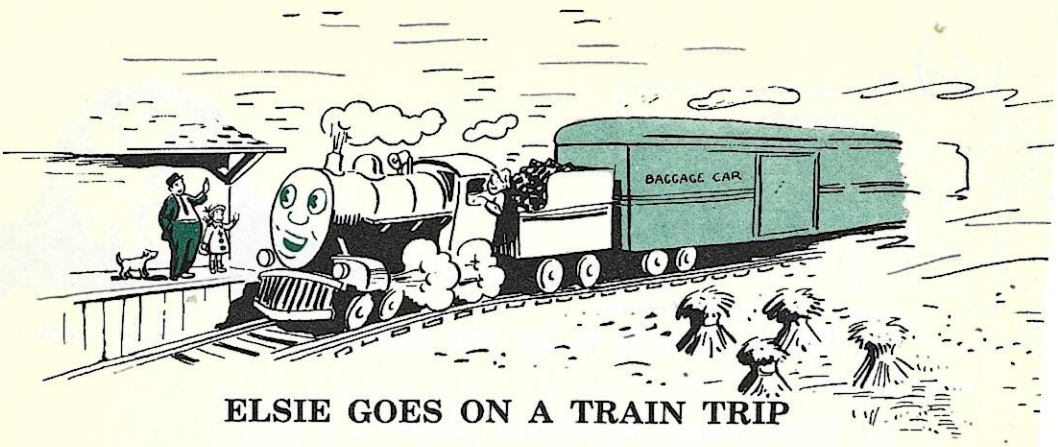
9. Name the months of the year in order.

10. Look at the calendar. On what day does the 16th of January come?

11. Find your birthday on a calendar and tell on what day your birthday comes this year.

12. Ask your teacher to teach you a rhyme that will help you to remember how many days there are in each month of the year. Memorize this table:

60 seconds (sec.)	= 1 minute (min.)
60 minutes (min.)	= 1 hour (hr.)
24 hours (hr.)	= 1 day (da.)
7 days (da.)	= 1 week (wk.)
52 weeks (wk.)	= 1 year (yr.)
365 days (da.)	= 1 year
366 days (da.)	= 1 leap year



ELSIE GOES ON A TRAIN TRIP

1. Elsie was planning to visit her grandmother. She went down town with her mother to buy some things she needed for the trip. She paid $8.50 for a travelling bag; $6.95 for a dress; $2.29 for a hat, and $2.65 for a present for grandmother. How much did she spend?

2. The next day Elsie went to the station to buy her railway ticket. The regular price was $7.50 but because she was so young, Elsie had to pay only half-fare. How much did her ticket cost?

3. Elsie's train left at 9 a.m. and she arrived at the station of her grandmother's village at 3.45 p.m. How long was she on the train?

4. Elsie paid $ .85 for her dinner on the train. How much change did she get if she paid for it with a $2.00 bill?

5. Elsie bought an orange from the news agent on the train. He told her that he had sold 67 oranges at 7¢ each. How much did he get for the oranges?

6. Elsie talked to a Mrs. Dick who got on the train at Halifax and was going to Vancouver. Elsie thought that was a very long trip. If it is 840 miles from Halifax to Montreal and 2930 miles from Montreal to Vancouver, how far is it from Halifax to Vancouver?

7. It takes a train 6 hours to go from Halifax to Moncton. If the train travels 31 miles an hour, how far is it from Halifax to Moncton?

MULTIPLYING BY 10

Mary has saved the 10 five-cent pieces below. How many cents has Mary saved?

5 + 5 + 5 + 5 + 5 + 5 + 5 + 5 + 5 + 5 = 50

We can find how many cents Mary has saved by adding 5 *ten times*. So Mary has saved 50 cents.

But *multiplication is a short way of adding* numbers that are the same.

so $10 \times 5 = 50$

We multiply by tens in the same way we multiply by ones, but when we multiply by tens the product is tens.

$10 \times 5 = 50$, which means 5 multiplied by *1 ten* which is *5 tens* or 50.

$10 \times 8 = 80$, which means 8 multiplied by *1 ten* which is *8 tens* or 80.

$10 \times 39 = 390$, which means 39 multiplied by *1 ten* which is *39 tens* or 390.

Now that you understand what it means to multiply by 10 here is a short way to multiply any number by 10.

To multiply a number by 10 write a zero after the number.

1. 10×74 10×91 10×87 10×65

2. 10×312 10×206 10×731 10×564

Multiply. Give the answers quickly.

3.

38	62	85	49	176	637	453
10	10	10	10	10	10	10

4. Mr. Black, the grocer, bought 10 cases of grapefruit juice. If there were 24 cans in each case, how many cans of juice did he buy?

MULTIPLYING BY A NUMBER ENDING IN ZERO

Tony sells 26 newspapers every day. How many newspapers does he sell in 30 days?

We can find out how many newspapers Tony sells by multiplying 26 by 30.

30 means 3 tens. When you multiply by 30 you are multiplying by 3 tens. You multiply by tens in the same way you multiply ones, but *when you multiply by tens the product is tens.*

26 multiplied by 3 tens is 78 tens or 780.

$$\begin{array}{r} 26 \\ \times 30 \\ \hline 780 \end{array}$$

Now that you understand that when you multiply by tens the product is tens, here is a short way to multiply by a number ending in zero. Look at the example above.

Write the numbers as shown. Write a zero in the product under the zero of the multiplier. Then multiply 26 by 3. Think, "3 6's are 18." *Write the 8 under the 3, the figure by which you multiplied.*

Think, "3 2's are 6 and 1 to carry are 7." Write the 7 on the left of the 8.

So Tony sold 780 newspapers.

To multiply by a number ending in zero write a zero in the product under the zero of the multiplier and multiply by the figure on the left of the zero.

Multiply. Check each answer.

1.	32	24	51	72	68	49	86
	20	40	30	60	50	80	70
2.	54	47	26	84	51	68	96
	50	30	90	20	70	40	60
3.	615	352	192	283	416	352	
	20	30	70	60	40	80	

4. Mr. Timmins travels 27 miles every day delivering the mail. How many miles does he travel in 40 days?

MULTIPLYING BY A TWO-FIGURE NUMBER

Yesterday Fred saw a train with 23 cars of coal. If each car held 45 tons, how many tons were carried by the train? To find out how many tons of coal there were we multiply 45 by 23.

45 ← multiplicand
23 ← multiplier
135 ← first partial product
90 ← second partial product
1035 ← product

The multiplier, 23, means 2 tens and 3 ones. Multiply 45 by 3. $3 \times 45 = 135$ ones. Write the 135 so that the 5 is in the ones' column.

The 2 in 23 means 2 tens. Multiply 45 by 2. $2 \times 45 = 90$ tens. Write the 90 so that the 0 is in the tens' column.

Add the partial products to get the product 1035.

So there were 1035 tons of coal carried by the train.

When multiplying by a two-figure number put the first figure of each partial product directly under the figure by which you multiply.

Multiply. Check each answer by doing the multiplication over again.

1.	31	52	61	54	65	70	80
	12	13	24	52	43	21	46
2.	82	50	45	67	95	40	76
	56	38	27	57	54	38	49
3.	86	59	80	69	76	47	89
	82	67	75	29	36	68	83
4.	39	90	84	68	96	70	58
	39	58	49	57	78	73	49

5.	217	148	350	406	418	352
	16	23	34	17	42	18
6.	632	564	378	569	592	398
	54	61	57	92	73	46

MULTIPLYING DOLLARS AND CENTS BY A TWO-FIGURE NUMBER

Bob and his sisters gave their mother 12 linen handkerchiefs for her birthday. If the handkerchiefs cost $.49 each, how much did they pay for them?

To find out how much they paid for the handkerchiefs we multiply $.49 by 12.

To multiply dollars and cents multiply in the same way you multiply other numbers.

Put a decimal point two places from the right in the product to separate the dollars and cents.

Put a dollar sign before the product.

So Bob and his sisters paid $5.88 for the handkerchiefs.

$ .49
12
98
49
$5.88

Multiply. Check each answer by doing the multiplication over again.

1.	$ .29 14	$ .63 61	$ .73 25	$ .60 39	$ .59 17	$ .53 19
2.	$ .73 68	$ .87 79	$ .59 95	$ .63 71	$ .58 34	$ .45 68
3.	$ .90 47	$ .74 72	$ .83 38	$ .34 59	$ .43 73	$ .89 62
4.	$2.47 17	$3.01 93	$2.70 69	$4.18 45	$3.48 26	$6.91 58
5.	$1.07 29	$5.70 38	$2.48 39	$3.78 47	$8.07 56	$2.37 98
6.	$4.78 85	$6.57 34	$6.48 19	$4.89 76	$5.86 98	$1.97 37

7. Mr. Gregor, the scout-master, bought 16 pounds of butter for the boys' camp. How much did he pay for it at $ .72 a pound?

PRACTICE IN MULTIPLICATION

Multiply. Check each answer by doing the multiplication over again.

1.	39 × 4	78 × 7	65 × 8	368 × 6	297 × 5	486 × 9
2.	740 × 3	802 × 4	409 × 7	800 × 5	307 × 9	209 × 8
3.	84 × 14	49 × 36	50 × 38	82 × 50	49 × 19	90 × 94
4.	56 × 80	87 × 76	69 × 67	40 × 39	97 × 85	78 × 69
5.	58 × 38	80 × 46	75 × 39	68 × 67	70 × 54	78 × 18
6.	54 × 40	79 × 53	76 × 18	29 × 74	96 × 86	60 × 45
7.	590 × 54	305 × 17	629 × 78	496 × 67	509 × 89	468 × 28
8.	362 × 65	518 × 27	107 × 68	678 × 39	394 × 84	459 × 95
9.	\$ .68 × 3	\$ .56 × 7	\$5.63 × 5	\$2.59 × 6	\$4.07 × 4	\$7.08 × 8
10.	\$ .58 × 61	\$ .60 × 37	\$ .97 × 84	\$6.49 × 36	\$3.58 × 49	\$2.09 × 25
11.	\$ .86 × 53	\$ .39 × 69	\$ .65 × 72	\$2.74 × 14	\$5.96 × 87	\$8.02 × 93

PROBLEMS USING MULTIPLICATION

1. Bobby likes to have a milk shake after school. Last week he bought 5 milk shakes. How much did he spend for them last week if they cost 15 cents each?

2. Ellen's father went on a business trip yesterday. Ellen says he drove his car for 7 hours and that he travelled 35 miles an hour. How far did he drive yesterday?

3. Mrs. Conrad bought 6 yards of cloth to make coats for her little daughters. If the cloth cost $2.15 a yard, how much did she pay for the cloth?

4. Mr. Fraser owns a market. He bought 36 cases of canned beans. If there were 24 cans in each case, how many cans of beans did he buy?

5. Mrs. Nolan bought a 12-pound turkey for Thanksgiving dinner. How much did she pay for it if it cost $ .52 a pound?

6. Mr. Marks works in an office and earns $35 a week. Last year he worked 50 weeks. How much did he earn last year?

7. Sally was helping to fill boxes with fudge for the the church fair. She put 18 pieces of fudge in each box. If she filled 26 boxes, how many pieces of fudge did she use?

8. There were 40 boys in the Youths' Club. If each boy paid $ .15 dues each month, how much did the club collect in dues each month?

9. Last Saturday, Mr. Carrer, the butcher, sold 58 pounds of beef at $ .43 a pound. How much did he take in for the beef?

10. Mr. Farr is a railroad conductor. Last month he made 16 trips. How many miles did he travel during the month if he travelled 210 miles on each trip?

KEEPING THE TOOLS SHARP

Add. Check each answer.

1.

45	54	48	16	72	56	28
7	6	8	9	8	6	7

2.

954	856	778	352	69	893
487	409	395	989	474	47
705	884	940	235	53	437
327	648	405	646	530	59
876	705	658	560	278	842
434	628	382	753	696	93

3.

$57.75	$92.66	$54.87	$ 8.44	$63.07
73.36	74.29	7.36	34.05	.94
55.56	56.96	90.62	5.88	8.46
38.04	72.40	48.06	52.05	.70
23.70	38.04	5.23	60.90	34.08
52.62	84.88	60.99	1.66	82.89

Subtract. Check each answer.

4.

826	491	924	674	932	236
317	462	491	476	347	179

5.

193	852	700	400	607	805
95	79	573	388	540	539

6.

600	900	200	812	611	713
304	509	105	578	387	595

7.

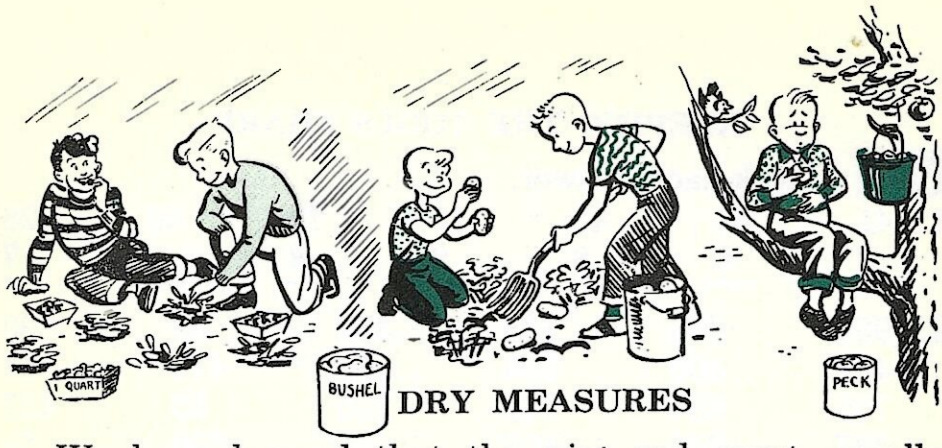
1277	1659	1337	8000	5000
749	864	768	5876	4217

8.

8541	3254	9021	6103	7103
4642	2795	6458	4007	5004

9.

67894	35057	18000	40204
26956	8109	14619	22985



DRY MEASURES

We have learned that the *pint* and *quart*, usually glass bottles or jars, are used to measure liquids. However, such *dry* things as berries, currants, cherries, and other small fruits are measured by the pint and quart. These dry measures are usually boxes or cartons.

1. In the picture above one boy is picking berries. What measure is he using?

2. Name as many things as you can that are sold by the dry pint and dry quart.

3. Use real measures to find how many dry pints there are in a dry quart.

4. By using real measures find out whether the liquid quart and the dry quart are the same size.

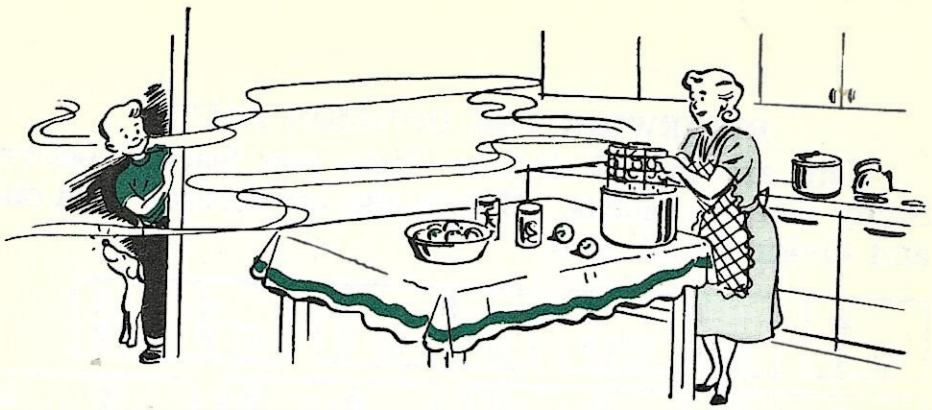
Grains, like wheat and oats; *large fruits*, like apples and peas; and *vegetables*, like potatoes and turnips are sold by the dry measures, the *peck* and the *bushel*.

5. Name as many things as you can that are sold by the peck and the bushel.

6. Memorize this table. Note the abbreviations.

2 pints (pt.) = 1 quart (qt.)
8 quarts (qt.) = 1 peck (pk.)
4 pecks (pk.) = 1 bushel (bu.)

The actual peck and bushel measures are seldom used today. When grains, large fruits, and vegetables are sold they are usually weighed. A bushel of potatoes weighs 60 pounds; a bushel of apples weighs 48 pounds; and a bushel of oats weighs 34 pounds.



CANNING FRUITS AND VEGETABLES

To keep her family provided with fruit and vegetables during the year, Mrs. Wagner preserves or cans fruits and vegetables every summer and fall.

1. Last summer Mrs. Wagner bought a new home canning machine for $23.50 and a cold pack canner for $2.75. How much did she pay for both?

2. She bought 200 cans at 5¢ each. How much did she pay for the cans?

3. She also bought 3 dozen glass preserving jars at $1.80 a dozen. How much did she pay for the jars?

4. Mrs. Wagner read that there should be 21 quarts of fruit canned for each member of the family. How many pints of fruit would that be for each?

5. She also read that there should be 55 pints of vegetables canned for each one in the family. If there are 5 people in the Wagner family, how many pints of vegetables should Mrs. Wagner can?

6. One day Bobby Wagner picked 3 pecks of beans in the garden. How many quarts of beans did he pick?

7. Mrs. Wagner bought a gallon of raspberries. How much did she pay for them at $ .35 a quart?

8. In all, Mrs. Wagner canned 65 qt. of tomatoes, 25 quarts of greens, 100 quarts of other vegetables, and 210 quarts of fruits and berries. How many quarts did she can altogether?

REVIEWING THE DIVISION FACTS

Here are the 64 division facts you learned before. Study them by blocks. Shown also are division with one and division with zero.

$2 \div 2 = 1$	$10 \div 2 = 5$	$6 \div 2 = 3$	$8 \div 2 = 4$
$12 \div 2 = 6$	$14 \div 2 = 7$	$18 \div 2 = 9$	$16 \div 2 = 8$
$15 \div 3 = 5$	$25 \div 5 = 5$	$20 \div 4 = 5$	$30 \div 5 = 6$
$35 \div 5 = 7$	$40 \div 5 = 8$	$45 \div 5 = 9$	$9 \div 3 = 3$
$18 \div 3 = 6$	$12 \div 3 = 4$	$24 \div 3 = 8$	$21 \div 3 = 7$
$27 \div 3 = 9$	$16 \div 4 = 4$	$28 \div 4 = 7$	$24 \div 4 = 6$
$36 \div 4 = 9$	$32 \div 4 = 8$	$36 \div 6 = 6$	$48 \div 6 = 8$
$42 \div 6 = 7$	$54 \div 6 = 9$	$49 \div 7 = 7$	$63 \div 7 = 9$
$56 \div 7 = 8$	$64 \div 8 = 8$	$81 \div 9 = 9$	$72 \div 8 = 9$

The Division Facts with One

$1 \div 1 = 1$	$2 \div 1 = 2$	$3 \div 1 = 3$	$4 \div 1 = 4$	$5 \div 1 = 5$	$6 \div 1 = 6$	$7 \div 1 = 7$	$8 \div 1 = 8$	$9 \div 1 = 9$
$2 \div 2 = 1$	$3 \div 3 = 1$	$4 \div 4 = 1$	$5 \div 5 = 1$	$6 \div 6 = 1$	$7 \div 7 = 1$	$8 \div 8 = 1$	$9 \div 9 = 1$	

Zero Divided by Any Number Gives Zero

$0 \div 1 = 0$	$0 \div 2 = 0$	$0 \div 3 = 0$	$0 \div 4 = 0$	$0 \div 5 = 0$	$0 \div 6 = 0$	$0 \div 7 = 0$	$0 \div 8 = 0$	$0 \div 9 = 0$

DIVISION WITH A REMAINDER

Alex has 32¢. How many 6¢ chocolate bars can he buy and how many cents will he have left over?

To find how many chocolate bars Alex can buy we divide 32 by 6.

$$\begin{array}{r} 5R2 \\ 6\overline{)32} \\ \underline{30} \\ 2 \end{array}$$

To find how many 6's in 32, *find the largest number smaller than 32 into which 6 divides evenly.* It is 30.

Think, "6's in 30 are 5, so 6's in 32 are 5." Write the 5 over the 2.

Multiply 6 by 5. $5 \times 6 = 30$. Write the 30 under the 32.

Subtract. $32 - 30 = 2$. The 2 is called the remainder.

So Alex can buy 5 chocolate bars and have 2¢ left over.

With a little practice you should be able to do exercises like the one above *in your head.* For example, to find $8\overline{)51}$ you should say, "8's in 51 are 6 and 3 remainder."

Find the quotient and the remainder. Do them in your head if possible.

1.	$2\overline{)17}$	$3\overline{)25}$	$5\overline{)42}$	$4\overline{)19}$	$6\overline{)28}$	$7\overline{)37}$
2.	$3\overline{)20}$	$5\overline{)38}$	$9\overline{)83}$	$7\overline{)\ 9}$	$8\overline{)39}$	$6\overline{)33}$
3.	$7\overline{)57}$	$4\overline{)26}$	$8\overline{)75}$	$9\overline{)68}$	$6\overline{)44}$	$5\overline{)48}$
4.	$2\overline{)11}$	$6\overline{)25}$	$3\overline{)28}$	$8\overline{)37}$	$7\overline{)55}$	$9\overline{)66}$
5.	$5\overline{)23}$	$7\overline{)44}$	$9\overline{)79}$	$6\overline{)50}$	$8\overline{)59}$	$7\overline{)32}$
6.	$4\overline{)22}$	$9\overline{)71}$	$6\overline{)\ 4}$	$8\overline{)53}$	$9\overline{)32}$	$3\overline{)19}$
7.	$9\overline{)88}$	$6\overline{)58}$	$8\overline{)49}$	$7\overline{)68}$	$8\overline{)29}$	$9\overline{)\ 5}$
8.	$5\overline{)17}$	$4\overline{)34}$	$7\overline{)60}$	$8\overline{)\ 4}$	$9\overline{)53}$	$6\overline{)56}$
9.	$6\overline{)39}$	$8\overline{)70}$	$9\overline{)60}$	$7\overline{)52}$	$5\overline{)43}$	$9\overline{)25}$

REVIEWING WHAT WE LEARNED ABOUT DIVISION

When we *divide* we find how many times one number is contained in another number. $6\overline{)42}$ asks how many 6's there are in 42. We know that $6+6+6+6+6+6+6=42$. We see, then, that 6's in 42 are 7.

The sign for division is $\overline{)}$ or $\div$

Look at the example on the right.

```
          7  <-- quotient
divisor 5)39 <-- dividend
         35
         --
          4  <-- remainder
```

The number by which we divide is called the *divisor*. The number divided is called the *dividend*. The answer in division is called the *quotient*. The number left over (if there is one) is called the *remainder*.

To check division multiply the quotient by the divisor and add the remainder (if there is one). If the answer is the same as the dividend the division is correct.

```
Check:
   7  <-- quotient
   5  <-- divisor
  --
  35
 +4  <-- remainder
  --
  39  <-- dividend
```

THINGS TO REMEMBER WHEN DIVIDING

Here are some things to remember when dividing. If you follow them you will get correct answers.

1. Make good clear figures.
2. When dividing start at the left.
3. Write the quotient figure (or figures) directly over the last figure of the dividend (or partial dividend).
4. The *product* of the quotient figure and the divisor *must not be greater than the dividend* (or partial dividend).
5. The *difference* between the product and the dividend (or partial dividend) *must be less than the divisor*.
6. The remainder should be written in the quotient.
7. Always check the division.
8. Other things to remember when dividing will be learned later.

DIVISION WITH CARRYING

An airplane flew 1235 miles in 5 hours. How many miles did it fly each hour?
To find how many miles the airplane flew each hour we *divide* 1235 by 5.

```
  247
5)1235
  10
  ---
   23
   20
   --
    35
    35
    --
```

To divide follow these steps:

1. *Divide.* The first *partial dividend* is 12. Think, 5's in 12 are 2." Write the 2 over the 2, the last figure of the partial dividend.
2. *Multiply.* $2 \times 5 = 10$. Write the product, 10, under the partial dividend, 12.
3. *Compare.* The product cannot be greater than the partial dividend.
4. *Subtract* 10 from 12. The remainder is 2.
5. *Compare.* The remainder must be less than the divisor.
6. *Bring down* the 3 from the dividend. Place the 3 under the 3 and next to the remainder 2. The new *partial dividend* is 23.

```
Check:
  247
  ×5
 1235
```

7. REMEMBER that when a figure is brought down from the dividend a figure must be placed above it in the quotient.

Now follow steps 1 to 7 again to divide 23 by 5.
Again follow steps 1 to 7 to divide 35 by 5.
There is no remainder in this exercise. Do not write the 0.
So the airplane flew 247 miles an hour.

Tell the steps followed in each of these exercises:

```
  341
6)2046
  18
  --
   24
   24
   --
    6
    6
    -
```

```
  513R4
7)3595
  35
  --
   9
   7
   -
  25
  21
  --
   4
```

DIVISION WITH CARRYING

Divide. Check each answer.

1.	$4\overline{)56}$	$3\overline{)78}$	$6\overline{)93}$	$5\overline{)83}$	$8\overline{)96}$
2.	$6\overline{)354}$	$5\overline{)395}$	$9\overline{)470}$	$3\overline{)137}$	$9\overline{)648}$
3.	$2\overline{)734}$	$3\overline{)524}$	$6\overline{)855}$	$5\overline{)658}$	$7\overline{)939}$
4.	$6\overline{)786}$	$7\overline{)849}$	$4\overline{)706}$	$8\overline{)969}$	$6\overline{)678}$
5.	$7\overline{)795}$	$2\overline{)673}$	$6\overline{)684}$	$4\overline{)567}$	$7\overline{)863}$
6.	$4\overline{)1752}$	$6\overline{)4314}$	$9\overline{)7040}$	$6\overline{)1574}$	
7.	$8\overline{)5049}$	$9\overline{)3429}$	$7\overline{)6237}$	$3\overline{)1478}$	
8.	$5\overline{)3565}$	$7\overline{)4986}$	$4\overline{)3272}$	$6\overline{)3098}$	
9.	$3\overline{)2621}$	$9\overline{)2079}$	$6\overline{)3139}$	$5\overline{)3357}$	
10.	$7\overline{)2198}$	$6\overline{)4286}$	$8\overline{)5697}$	$4\overline{)1696}$	
11.	$9\overline{)5049}$	$8\overline{)7369}$	$7\overline{)2068}$	$5\overline{)4145}$	
12.	$2\overline{)1954}$	$6\overline{)2948}$	$5\overline{)1587}$	$8\overline{)6496}$	
13.	$7\overline{)1897}$	$9\overline{)3736}$	$8\overline{)6065}$	$6\overline{)3684}$	
14.	$4\overline{)2073}$	$3\overline{)1025}$	$7\overline{)3045}$	$5\overline{)4075}$	
15.	$6\overline{)4887}$	$7\overline{)2884}$	$5\overline{)2955}$	$8\overline{)7745}$	
16.	$2\overline{)1530}$	$4\overline{)3847}$	$6\overline{)5498}$	$9\overline{)2956}$	

WATCH THE ZEROS IN THE QUOTIENT

Be sure to put zeros in the quotient when they are needed. If you are not on the alert here you are apt to make a mistake. You will not miss putting zeros in the quotient if you REMEMBER *that when a figure is brought down from the dividend a figure must be placed above it in the quotient.*

ZERO AT THE END OF THE QUOTIENT

```
  470          340R2
5)2350       4)1362
  20           12
  --           --
  35           16
  35           16
  --           --
   0            2
```

Tell how each of the examples on the left is done. Notice that there is a zero at the end of each quotient.

Divide. Check each answer.

1. $3\overline{)90}$ $4\overline{)82}$ $6\overline{)360}$ $5\overline{)452}$ $7\overline{)424}$
2. $7\overline{)1260}$ $6\overline{)3245}$ $3\overline{)2371}$ $9\overline{)5580}$
3. $4\overline{)1921}$ $8\overline{)4724}$ $5\overline{)2650}$ $7\overline{)4135}$

ZERO IN THE MIDST OF THE QUOTIENT

```
  709          603R2
6)4254       3)1811
  42           18
  --           --
  54           11
  54            9
  --           --
               2
```

Tell how each of the examples on the left is done. Notice that there is a zero in the midst of each quotient.

Divide. Check each answer.

1. $3\overline{)621}$ $2\overline{)817}$ $5\overline{)539}$ $4\overline{)420}$ $7\overline{)747}$
2. $6\overline{)1249}$ $7\overline{)4921}$ $9\overline{)1876}$ $7\overline{)4927}$
3. $9\overline{)2785}$ $6\overline{)3057}$ $5\overline{)2035}$ $9\overline{)6352}$

DIVIDING DOLLARS AND CENTS

Mr. Todd sold 8 bushels of potatoes for \$11.44. How much did he get for each bushel?
To find out how much he got for each bushel we *divide* \$11.44 by 8.
To divide dollars and cents divide in the same way that you divide other numbers.
Put a decimal point in the quotient exactly over the decimal point in the dividend.
Put a dollar sign before the quotient.
So Mr. Todd got \$1.43 for each bushel of potatoes.

```
  $ 1.43
8)$11.44
   8
   34
   32
    24
    24
```

Check:
\$1.43
×8
\$11.44

Explain how the examples on the right are done. →

```
  $ .62
4)$2.48
  24
   8
   8
```

```
  $ .18
5)$ .90
   5
   40
   40
```

Divide. Check each answer.

1.	3)\$8.16	4)\$6.32	5)\$5.85	6)\$7.56
2.	5)\$8.50	7)\$8.40	3)\$7.20	4)\$7.60
3.	8)\$30.40	6)\$58.20	7)\$33.60	9)\$67.50
4.	4)\$8.36	2)\$4.18	5)\$5.45	6)\$6.54
5.	8)\$56.48	7)\$63.49	6)\$54.24	9)\$72.72
6.	4)\$1.36	3)\$1.68	7)\$4.41	8)\$5.20
7.	3)\$ .48	4)\$ .68	6)\$ .96	7)\$ .84

PROBLEMS USING DIVISION

1. Miss Donald is teaching her class of girls to sew. Yesterday, she paid 72¢ for 8 spools of thread. How much did each spool cost?

2. Jack's mother sent him to the store to buy sugar. She gave him 50¢ and told him to buy as many pounds of sugar as he could, and to keep what money was left over for himself. If the sugar cost 9¢ a pound, how many pounds of sugar did Jack buy, and how many cents did he have left over?

3. Bob's father earns $43.50 a week. If he works 6 days a week, how much does he earn a day?

4. Mary's family were on a motor trip for 5 days last summer. If they drove 1350 miles altogether, about how many miles did they travel each day?

5. Last Saturday Mrs. Parker paid $1.72 for 4 pounds of beef. How much a pound did the beef cost?

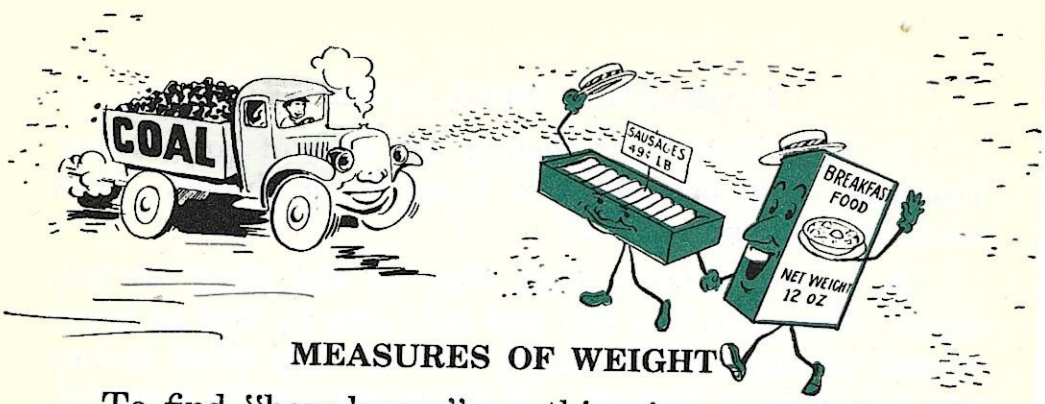
6. How many boxes will be needed to pack 2454 Christmas candles if each box is to hold 6 candles?

7. Mrs. Arthur bought 4 new dining-room chairs. If she paid $19.92 for them, how much did she pay for each chair?

8. "How much do I owe you for the gasoline?" said Mr. Conn to the man at the filling-station. "That will be $2.94," replied the man. "How many gallons did you put in?" asked Mr. Conn. "I put in 7 gallons," said the man. What was the price of the gasoline a gallon?

9. In 6 days last week Mr. Heath delivered 2304 quarts of milk. How many quarts did he deliver each day?

10. Four boys delivered 3040 handbills for Mr. Saver's sale. How many handbills did each boy deliver if each delivered the same number?



MEASURES OF WEIGHT

To find "how heavy" anything is we *weigh* it. The measures of weight are the *pound*, the *ounce*, and the *ton*.

1. List 10 things which you can buy by the pound.

Things that weigh less than a pound are bought by the *ounce*. Many things like garden seeds, spices, etc. are bought in small quantities by the ounce.

2. Name as many things as you can that are bought by the ounce.

Many things that we buy in packages, or in cans, have their *net weight* printed on the container. Net weight means the *weight of the contents* of the package or can. Usually these weights are expressed in ounces.

3. When you go home today make a list of the things you can find whose net weights are expressed in ounces.

Very heavy things like coal or things that come in large quantities, like hay, are bought and sold by the ton. *A ton weighs 2000 pounds.* The smaller automobiles you see weigh somewhat more than one ton.

4. Memorize this table. Note the abbreviations.

16 ounces (oz.) = 1 pound (lb.)
2000 pounds (lb.) = 1 ton (T.)

5. Margie bought $\frac{1}{2}$ lb. of chocolates. How many ounces of chocolates did she buy?

6. Mr. Snook used 14 tons of coal last winter. How many pounds of coal was that?

KEEPING THE TOOLS SHARP

Add. Check each answer.

1.

3063	9766	4954	4617	9061
9895	6077	3508	8805	6297
6406	8822	2824	3427	5060
2870	7590	9450	6706	7122
5452	4807	3941	8418	8091
3665	7329	6760	2509	2273

2.

$48.76	$47.94	$ 3.86	$ .69	$ 2.87
84.54	8.07	97.89	85.48	.85
99.01	85.72	67.70	8.04	29.30
20.60	5.08	1.08	57.50	.81
89.55	94.90	76.52	84.89	98.03
79.30	3.44	7.26	.92	23.20

Subtract. Check each answer.

3.

1191	1368	1564	1267	1640
483	680	586	779	953

4.

1420	1500	1900	5000	4000
565	871	956	2314	3168

5.

$74.56	$24.27	$43.01	$30.00	$71.02
39.67	16.59	27.66	10.32	60.14

6.

64853	13523	10004	29432
27390	6695	5147	23349

7.

57528	78430	60284	80307
18665	37977	43375	76458

8.

30005	40703	21012	51131
24126	18125	17508	23067

KEEPING THE TOOLS SHARP

Multiply. Check each answer.

1.	417 × 4	391 × 6	589 × 8	647 × 9	728 × 7	839 × 5
2.	5478 × 3	1569 × 7	4782 × 6	3467 × 8	5839 × 9	
3.	603 × 2	207 × 5	3080 × 4	5090 × 8	6007 × 9	
4.	67 × 30	94 × 80	65 × 59	75 × 68	85 × 47	96 × 83	97 × 69
5.	563 × 28	467 × 64	754 × 91	830 × 47	608 × 59	905 × 83
6.	\$ .15 × 6	\$ .49 × 8	\$5.26 × 7	\$ .63 × 19	\$3.87 × 72	\$9.04 × 94

Divide. Check each answer.

7.	$5\overline{)75}$	$3\overline{)56}$	$4\overline{)136}$	$7\overline{)387}$	$6\overline{)461}$
8.	$4\overline{)628}$	$5\overline{)842}$	$9\overline{)5886}$	$3\overline{)1130}$	$7\overline{)6703}$
9.	$7\overline{)917}$	$6\overline{)967}$	$8\overline{)4248}$	$5\overline{)3908}$	$6\overline{)1689}$
10.	$3\overline{)948}$	$5\overline{)563}$	$6\overline{)5478}$	$8\overline{)3298}$	$7\overline{)6395}$
11.	$9\overline{)546}$	$4\overline{)2360}$	$7\overline{)6931}$	$6\overline{)2760}$	$8\overline{)7844}$
12.	$6\overline{)636}$	$9\overline{)3663}$	$5\overline{)1539}$	$7\overline{)4225}$	$9\overline{)8121}$
13.	$7\overline{)\$\ .91}$	$4\overline{)\$2.72}$	$8\overline{)\$6.64}$	$6\overline{)\$29.40}$	$9\overline{)\$45.63}$

PROBLEMS WITHOUT NUMBERS

When you are working a problem you should always *decide what you must do with the numbers before you do anything at all with them.* Here are some problems without numbers to give you practice in deciding what to do—whether to add, subtract, multiply, or divide.

1. If you know the prices of a book, a school-bag, and a pen, what would you do to find the cost of them all?

2. How can Fred find how much more he weighs than his little brother?

3. If you know how much several dozen eggs cost, how can you find the cost of a dozen eggs?

4. Kathleen knows the price of a pound of butter and how many pounds her mother told her to buy. How can she find how much she will have to pay for the butter?

5. Jack knows how much his father earns in a day and how many hours a day he works. What would Jack do to find how much his father earns in an hour?

6. If you know how many people live in each of several towns, how can you find how many people live in all those towns?

7. Edna knows how many inches there are in a foot. How can she find how many inches there are in several feet?

8. Mr. Jones knew how many miles he drove his car on a trip, and how many hours he drove. What would he have to do to find about how many miles he drove each hour?

9. Mary knows how much money she has in her bank and how much a pair of skates cost. How can she find how much money will be left in her bank when she pays for the skates?

ESTIMATING THE ANSWER

The only kind of answer to a problem which is any good is a correct answer. Sometimes, through carelessness, we get an answer that is not reasonable. We can be sure of getting a reasonable answer if we find out, before we do the work, *about what the answer should be.* We call this *estimating* the answer.

When we do the work we can *compare* the answer we get with the estimated answer to see if our answer is reasonable. Then to make sure our work is correct we should *check* it.

Mr. Haley earns \$6.90 a day. How much does he earn in 6 days?

How to estimate the answer.

\$6.90 is about the same as \$7. So Mr. Haley earns about $6 \times \$7 = \$42$ in 6 days.
We see that the answer, \$41.40, is about the same as the estimated answer, \$42, so the answer is *reasonable.* To make sure it is correct, check the work.

The work

\$6.90
$\times 6$
\$41.40

Estimate the answers, then work the problems below:

1. If eggs cost \$ .62 a dozen, how much will 3 dozen cost?

2. Mrs. Brown paid \$2.04 for 4 yards of ribbon. How much a yard did she pay for it?

3. Nora had saved \$11.85. She bought a dress for \$3.95. How much did she have left?

Which of the answers shown for each exercise below is reasonable? Then do the work to see if you were right.

4.	$8 \times 297 =$	1600?	2400?	2600?
5.	$\$89.70 - 39.90 =$	\$50?	\$60?	\$40?
6.	$9)\overline{\$178.20} =$	\$15?	\$25?	\$20?
7.	$68 + 89 + 52 =$	150	210	300

GETTING THE CORRECT ANSWERS TO PROBLEMS

Don't be in too much of a hurry when working a problem. Don't do the first thing that comes to your mind with the numbers; you may get the wrong answer. *It pays to think before you decide what to do.*

If you follow the steps below they will help you to get the correct answer to a problem.

1. **Understand the Problem.** Read the problem carefully. Get a picture in your mind of what the problem says.
2. **What Does the Problem Tell Me?**
3. **What Does the Problem Ask Me to Find?**
4. **What Numbers Must I Work With?**
5. **What Must I Do with the Numbers?** Must I add, subtract, multiply or divide?
6. **Estimate the Answer.**
7. **Do the Work.**
8. **Is the Answer Reasonable?**
9. **Check the Work.**

1. Fred's father bought him some winter clothing. He paid $13.20 for an overcoat; $3.69 for a sweater; $ .89 for a pair of gloves; and $2.49 for overshoes. How much did he spend?

2. Last week Jean worked 8 hours as a baby-sitter. If she got $ .35 an hour, how much did she earn last week?

3. Mr. Lester wanted to buy an automobile. A dealer showed him two; one at $2045 and another at $1878. What was the difference in the prices?

4. There are four schools in Canton. In Brown School there are 175 pupils; in Black School, 347 pupils; in White School, 285 pupils; and in Green School, 476 pupils. How many pupils are there in the four schools?

5. Lillian has 87¢ in her purse. How many oranges can she buy if the oranges cost 6¢ each, and how many cents will she have left over?

6. Mrs. Sweet bought 3 pounds of halibut yesterday. How much did she pay for it if the halibut cost $ .37 a pound?

7. Bill and Leo each went on a cycling trip last summer. Bill rode 132 miles and Leo rode 87 miles. How much farther did Bill travel than Leo?

8. Mr. Fraser bought 4 new tires for his car. How much did each tire cost if he paid $72.40 for the four?

9. Frankie is saving his money to buy a fishing rod which costs $5.00. He has saved $3.67. How much more must he save before he can buy the rod?

10. The Mason family bought 6 shirts for Mr. Mason for Father's Day. How much did they pay for them if the shirts cost $3.49 each?

11. Mr. Green has a large plum orchard. How many 8-quart baskets will Mr. Green need for 2136 quarts of plums?

12. A radio dealer ordered 20 radios from a manufacturer. How much will he pay for the radios if they cost $28 each?

13. Sally had saved $23.00 during the year. At Christmas she spent $16.45 for presents for her family and friends. How much did she have left?

14. For the month of November, Mr. Johnson had the following household expenses: groceries, $43.29; light, $3.85; rent, $35.00; coal, $16.42. How much did he pay out in November?

15. A factory had a coal pile of 1863 tons. If it uses 9 tons of coal a day, how many days will the coal pile last?

16. If a train travels 38 miles an hour, how far will it travel in 14 hours?

KEEPING THE TOOLS SHARP

Add. Check each answer.

1.

984	305	966	678	476	881
503	867	780	505	949	760
486	686	475	583	682	667
960	957	792	809	368	450
554	733	240	257	986	791
737	506	969	498	840	370

2.

7804	9105	7089	5864	6025
4537	9058	6933	7609	4609
9256	3276	9805	3074	8875
3904	7050	3778	8805	1603
8476	6394	8020	2937	7915
6457	2032	5615	9302	7034

Subtract. Check each answer.

3.

1543	1342	1438	1260	1500
828	562	959	968	834

4.

6000	8000	8672	7836	8102
3492	7535	7783	5949	4004

5.

33828	87261	19183	40001
19351	85453	9534	6277

6.

76479	71200	60006	24639
50697	40805	3839	23672

7.

59000	45359	74204	30705
36957	43766	68526	20709

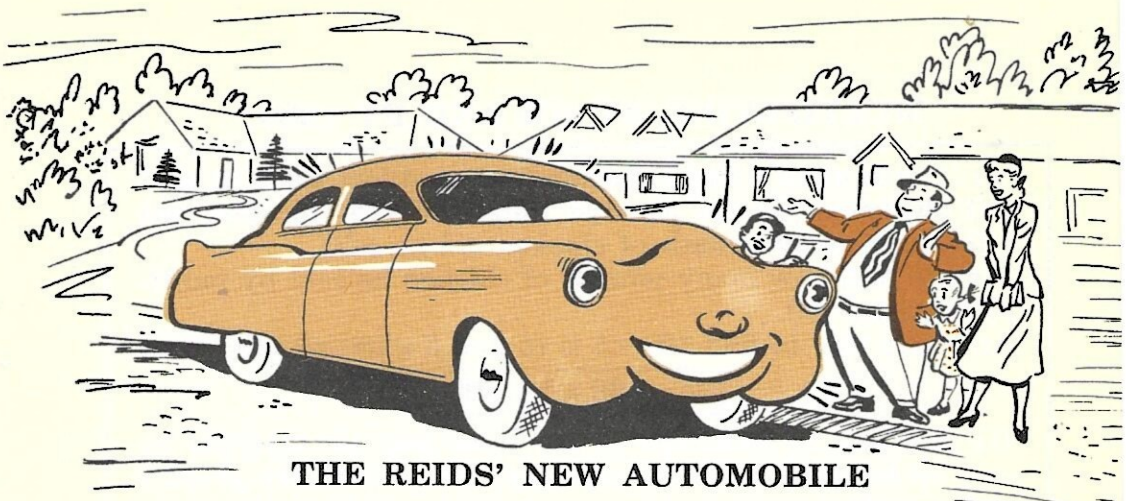
KEEPING THE TOOLS SHARP

Multiply. Check each answer.

1.	$\begin{array}{r} 813 \\ \times\ 6 \\ \hline \end{array}$	$\begin{array}{r} 961 \\ \times\ 7 \\ \hline \end{array}$	$\begin{array}{r} 617 \\ \times\ 5 \\ \hline \end{array}$	$\begin{array}{r} 367 \\ \times\ 8 \\ \hline \end{array}$	$\begin{array}{r} 689 \\ \times\ 4 \\ \hline \end{array}$	$\begin{array}{r} 268 \\ \times\ 9 \\ \hline \end{array}$
2.	$\begin{array}{r} 3214 \\ \times\ 7 \\ \hline \end{array}$	$\begin{array}{r} 5141 \\ \times\ 5 \\ \hline \end{array}$	$\begin{array}{r} 4582 \\ \times\ 8 \\ \hline \end{array}$	$\begin{array}{r} 5796 \\ \times\ 6 \\ \hline \end{array}$	$\begin{array}{r} 3597 \\ \times\ 9 \\ \hline \end{array}$	$\begin{array}{r} 4619 \\ \times\ 8 \\ \hline \end{array}$
3.	$\begin{array}{r} 702 \\ \times\ 4 \\ \hline \end{array}$	$\begin{array}{r} 407 \\ \times\ 6 \\ \hline \end{array}$	$\begin{array}{r} 804 \\ \times\ 9 \\ \hline \end{array}$	$\begin{array}{r} 9003 \\ \times\ 5 \\ \hline \end{array}$	$\begin{array}{r} 8070 \\ \times\ 7 \\ \hline \end{array}$	$\begin{array}{r} 6030 \\ \times\ 3 \\ \hline \end{array}$
4.	$\begin{array}{r} 69 \\ \times\ 16 \\ \hline \end{array}$	$\begin{array}{r} 47 \\ \times\ 84 \\ \hline \end{array}$	$\begin{array}{r} 59 \\ \times\ 70 \\ \hline \end{array}$	$\begin{array}{r} 78 \\ \times\ 96 \\ \hline \end{array}$	$\begin{array}{r} 39 \\ \times\ 18 \\ \hline \end{array}$	$\begin{array}{r} 93 \\ \times\ 40 \\ \hline \end{array}$	$\begin{array}{r} 76 \\ \times\ 95 \\ \hline \end{array}$
5.	$\begin{array}{r} 538 \\ \times\ 68 \\ \hline \end{array}$	$\begin{array}{r} 469 \\ \times\ 94 \\ \hline \end{array}$	$\begin{array}{r} 905 \\ \times\ 35 \\ \hline \end{array}$	$\begin{array}{r} 379 \\ \times\ 39 \\ \hline \end{array}$	$\begin{array}{r} 407 \\ \times\ 65 \\ \hline \end{array}$	$\begin{array}{r} 274 \\ \times\ 78 \\ \hline \end{array}$
6.	$\begin{array}{r} \$3.09 \\ \times\ 6 \\ \hline \end{array}$	$\begin{array}{r} \$\ .82 \\ \times\ 5 \\ \hline \end{array}$	$\begin{array}{r} \$\ .75 \\ \times\ 49 \\ \hline \end{array}$	$\begin{array}{r} \$4.78 \\ \times\ 38 \\ \hline \end{array}$	$\begin{array}{r} \$7.09 \\ \times\ 97 \\ \hline \end{array}$	

Divide. Check each answer.

7.	$6\overline{)84}$	$4\overline{)95}$	$5\overline{)740}$	$4\overline{)630}$	$7\overline{)791}$
8.	$8\overline{)612}$	$7\overline{)509}$	$6\overline{)216}$	$9\overline{)759}$	$5\overline{)476}$
9.	$7\overline{)4655}$	$4\overline{)2947}$	$8\overline{)3688}$	$6\overline{)5528}$	
10.	$8\overline{)7296}$	$7\overline{)4286}$	$5\overline{)4078}$	$9\overline{)8505}$	
11.	$7\overline{)5950}$	$8\overline{)6327}$	$9\overline{)5947}$	$5\overline{)1950}$	
12.	$3\overline{)2718}$	$6\overline{)4815}$	$8\overline{)7212}$	$9\overline{)3659}$	
13.	$8\overline{)1934}$	$4\overline{)1084}$	$5\overline{)4563}$	$7\overline{)6162}$	
14.	$4\overline{)\$9.48}$	$6\overline{)\$38.64}$	$8\overline{)\$3.60}$	$7\overline{)\$\ .84}$	



THE REIDS' NEW AUTOMOBILE

1. Mr. Reid wanted to buy a new automobile. One he liked was priced $2190 and another he liked was priced $2340. What was the difference in the prices of the automobiles?

2. He bought the car which was priced $2190. He traded in his old car for $725. How much more did he have to pay to get the new car?

3. He did not have enough ready money to pay the whole price of the automobile. He made a down payment and promised to pay the balance of $495 in equal amounts in 9 months. How much did he have to pay each month?

4. One day he bought 8 gallons of gasoline at $ .42 a gallon. How much did he pay for the gasoline?

5. The same day he had the engine oil changed. It cost him $2.25 for 5 quarts of oil. How much did the oil cost a quart?

6. He bought seat-covers and a radio for his new automobile. If the seat-covers cost $36.85 and the radio cost $117.50, how much did they cost altogether?

7. The first month Mr. Reid had his new automobile he drove it 817 miles. The next month he drove it 1302 miles. How many more miles did he drive the second month than the first month?

MULTIPLYING BY 100 AND BY 1000

Mr. Crane owns a large chicken farm and last week he sold 100 chickens. If the average weight of the chickens was 5 lb., how many pounds of chicken did he sell?
We can find how many pounds of chicken he sold by multiplying 5 by 100.
An easier way to find 100×5 is to find 5×100 which is 500.

so, $100 \times 5 = 500$

We multiply by hundreds in the same way we multiply by ones or tens, but when we multiply by hundreds the product is hundreds.

$100 \times 5 = 500$ which means 5 multiplied by 1 hundred which is 5 hundreds or 500.

In the same way $100 \times 63 = 6300$ which means 63 multiplied by 1 hundred which is 63 hundreds or 6300.

Now that you understand what it means to multiply by 100, here is a short way of multiplying by 100.

To multiply a number by 100 write two zeros after the number.

Give the answers orally.

1.	100×23	100×51	100×87	100×39
2.	100×265	100×493	100×674	100×872

We multiply by thousands in the same way we multiply by ones, tens, and hundreds, but when we multiply by thousands the product is thousands.

1000×3 means 3 multiplied by 1 thousand which is 3 thousands or 3000.

so, $1000 \times 3 = 3000$
and $1000 \times 26 = 26000$

To multiply a number by 1000 write three zeros after the number.

Give the answers orally.

3.	1000×46	1000×79	1000×95	1000×68
4.	1000×115	1000×403	1000×824	1000×365

MULTIPLYING BY NUMBERS ENDING IN ZEROS

There are 34 pounds in a bushel of oats. How many pounds are there in 400 bushels?

To find how many pounds there are in 400 bushels, multiply 34 by 400.

$$\begin{array}{r} 34 \\ 400 \\ \hline 13600 \end{array}$$

400 means 4 hundreds. When you multiply by 400 you are multiplying by 4 hundreds. You multiply by hundreds in the same way you multiply by ones, but when you multiply by hundreds the product is hundreds.

34 multiplied by 4 hundred is 136 hundreds or 13600.

Now that you understand that when you multiply by hundreds the product is hundreds, here is a short way of multiplying by numbers ending in zero. Look at the work above.

Write the numbers as shown. Write a zero in the product under each zero in the multiplier and multiply 34 by 4. $4 \times 34 = 136$.

So there are *13600 pounds in 400 bushels* of oats.

Rule: To multiply by a number ending in zeros, write a zero in the product under each zero in the multiplier and multiply by the figure or figures on the left of the zeros.

Tell how each of these is done. →

128	62	84
300	3000	1700
38400	186000	58800
		84
		142800

Multiply. Check each answer.

1.	76	85	194	374	691
	900	500	4000	6000	7000
2.	419	263	564	97	65
	380	460	2700	1300	3900

3. Mr. Rogers sold 300 tons of hay at $19 a ton. How much did he get for the hay?

MULTIPLYING BY A 3-FIGURE NUMBER

If a freight car holds 138 barrels of apples, how many barrels will 124 freight cars carry?

To find how many barrels of apples will be carried, multiply 138 by 124

The 4 in 124 means 4 ones. Multiply 138 by 4 ones. $4 \times 138 = 552$. Put the 2 directly under the 4 ones, *the figure by which you multiplied.*

The 2 in 124 means 2 tens. Multiply 138 by 2 tens. $2 \times 138 = 276$. Put the 6 directly under the 2 tens, *the figure by which you multiplied.*

The 1 in 124 means 1 hundred. Multiply 138 by 1. $1 \times 138 = 138$. Put the 8 directly under the 1 hundred, *the figure by which you multiplied.*

Add the three partial products.

So 17112 barrels of apples will be carried.

138
124
552
276
138
17112

When multiplying by a three-figure number put the first figure of each partial product directly under the figure by which you multiply.

Multiply. Check each answer.

1.	146	325	638	479	987	506
	132	147	256	318	473	319
2.	628	736	940	459	708	560
	468	529	287	365	496	287
3.	492	867	307	958	680	897
	469	674	178	925	318	789
4.	641	573	749	864	758	975
	327	285	614	539	872	698

5. Mr. Thompson, a railway conductor, made 274 trips last year. If his train travelled 265 miles each trip, how many miles did he travel during the year?

6. A barrel of flour weighs 196 lb. What is the total weight of 148 barrels of flour?

MULTIPLYING BY A 3-FIGURE NUMBER WITH ZERO IN THE MIDDLE OF THE MULTIPLIER

Mr. Conn took in an average of $413 every day his store was open last year. If his store was open for business 306 days, what was the amount of his sales for the year?

To find out the amount of Mr. Conn's sales for the year, multiply 413 by 306.

Remember what each figure in the multiplier, 306, means.

Multiply 413 by 6. $6 \times 413 = 2478$. Put the 8 directly under the 6, *the figure by which you multiplied.*

Write a zero in the second partial product under the zero in the multiplier.

Then multiply 413 by 3. $3 \times 413 = 1239$. Put the 9 directly under the 3, *the figure by which you multiplied.*

So, the amount of Mr. Conn's sales last year was $126,378.

	413
	306
	2478
	12390
	126378

Multiply. Check each answer.

1.	247	456	389	674	793	890
	103	207	406	509	608	903
2.	567	892	978	607	496	738
	408	509	802	107	306	905
3.	319	650	849	523	907	458
	207	609	708	309	806	607
4.	915	628	739	670	809	945
	504	308	706	409	907	608

5. Some crates of oranges have 148 oranges in them. How many oranges would there be in a shipment of 107 such crates of oranges?

6. If a freight car carries 915 bushels of wheat, how many bushels of wheat would be carried by 203 such freight cars?

MULTIPLYING DOLLARS AND CENTS BY A 3-FIGURE MULTIPLIER

A department store put on a sale of girls' dresses at \$3.49 each. How much money did the store take in if 236 dresses were sold?

To find how much money the store took in *multiply* \$3.49 by 236.

To multiply dollars and cents multiply the same way you multiply other numbers.

Put a decimal point in the product two places from the right to separate the dollars and cents.

Put a dollar sign before the product.

So the store took in \$823.64 from the sale of the dresses.

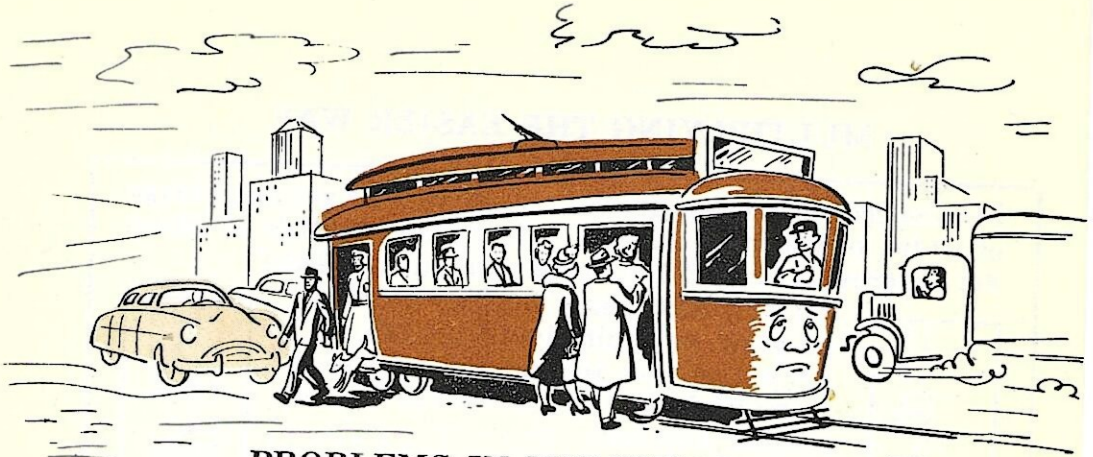
\$3.49	
2 36	
20 94	
104 7	
698	
\$823.64	

Tell how each of these is done. →

\$2.67	\$5.18
4 30	1 07
80 10	36 26
1068	518 0
\$1148.10	\$554.26

Multiply. Check each answer by doing the multiplication over again.

1.	\$1.54	\$2.93	\$5.76	\$7.08	\$8.46	\$6.97
	1 32	1 63	2 47	4 59	3 56	8 74
2.	\$3.82	\$4.07	\$6.95	\$9.28	\$7.98	\$5.96
	2 79	1 64	5 83	6 95	3 78	2 94
3.	\$4.32	\$3.87	\$8.54	\$7.45	\$6.97	\$7.32
	8 20	4 90	6 70	5 90	9 60	3 70
4.	\$2.65	\$4.93	\$7.18	\$9.76	\$8.97	\$9.43
	1 08	3 05	4 09	8 05	2 06	8 09
5.	\$3.45	\$8.56	\$9.36	\$7.85	\$6.54	\$9.41
	1 00	3 00	6 00	8 00	9 00	7 00



PROBLEMS IN MULTIPLICATION

1. A street car in the town of Alberton carried an average of 312 passengers a day last year. How many passengers did it carry if it ran 365 days last year?

2. A wholesale flour dealer received a shipment of 100 barrels of flour. A barrel of flour weighs 196 lbs. How many pounds of flour were in the shipment?

3. The school board ordered 300 desks for the new school. How much did these desks cost at $5.75 each?

4. Mr. Walker delivered an average of 675 letters a day. How many letters did he deliver last year if he worked 286 days?

5. The hockey play-off was on. The fans of Stenton hired a special train to take them to the game. If 345 fans paid $2.50 each for train tickets, how much did they pay for the special train?

6. The Farmers Co-operative shipped 138 cases of eggs to a dealer. How many eggs did they ship if each case held 360 eggs?

7. Mr. Tutty worked on a big job last year for 207 days. How much did he earn on this job if his wages were $6.45 a day?

8. At a shoe sale 148 pairs of shoes were offered at $4.95 a pair. How much money was taken in if all these shoes were sold?

MULTIPLYING THE EASIER WAY

Mr. Jackson is a wheat grower. Last year he got an average of 19 bu. of wheat to an acre. How many bushels of wheat did he grow if he had 145 acres planted in wheat?

To find how many bushels of wheat he grew we multiply 19 by 145.

An easier way to find the answer is to multiply the larger number by the smaller number.

The sense of the problem will tell us the name of the answer. In this problem the sense of the problem tells us that the answer is named "bushels".

So Mr. Jackson grew 2755 bu. of wheat.

```
 19
145
 95
 76
19
2755
```

```
 145
  19
1305
145
2755
```

Multiply the easier way. Check each answer.

1. 47×6 39×8 89×5 265×7

2. 392×8 176×23 406×48 619×59

Do the following. After you find the product the easier way, *give the answer its name from the sense of the problem.*

3. At the school picnic, Tony sold 5¢ ice-cream cones. How much did he take in if he sold 245 cones?

4. There are 7 days in a week. How many days are there in 48 weeks?

5. A bushel of potatoes weighs 60 lb. How many pounds are there in a shipment of 425 bu.?

6. A lobster factory shipped 237 cases of lobsters. If there were 24 cans in each case, how many cans were shipped?

7. Mr. Crabb sells fishing lines at 15¢ each. How much did he take in if he sold 163 lines?

8. How many Christmas cards are there in 217 boxes if each box holds 36 cards?

DIAGNOSTIC TEST IN MULTIPLICATION BY A 3-FIGURE NUMBER

The work below will test you on the kinds of multiplication by a three-figure number you should know. If you make mistakes on any kind, go back and do again the exercises on the page whose number is shown on the right.

						Page
Multiplying by 100						
1.	324 100	517 100	608 100	493 100	705 100	56
Multiplying by Numbers Ending in Zeros						
2.	417 300	397 500	705 600	682 400	569 800	
3.	536 240	63 700	589 3000	819 1200	74 2300	57
Multiplying by a 3-Figure Number						
4.	482 176	396 468	758 359	709 287	904 694	58
Multiplying by a 3-Figure Number with Zero in the Middle of the Multiplier						
5.	287 104	638 306	954 507	804 802	705 906	59
Multiplying Dollars and Cents by a 3-Figure Number						
6.	\$2.57 1 54	\$4.68 3 72	\$7.95 6 48	\$3.68 2 90	\$5.89 7 80	
7.	\$3.29 3 06	\$9.46 5 09	\$8.57 4 08	\$9.73 7 00	\$5.28 9 00	60

TWO-STEP PROBLEMS

Tom's mother bought a 6 pound chicken which cost $.48 a pound. How much change did she get from a $5.00 bill? There is only one question asked in this problem. However, *there is another question which is hidden. We must find the answer to the hidden question first and use this answer to find the answer to the question the problem asks.*

The problem asks, "How much change did she get from a $5.00 bill? To find out, we must first find the answer to the hidden question, "How much did she pay for the chicken?"

To find the answer to the hidden question we *multiply* $.48 by 6 which gives $2.88.

Now use the first answer ($2.88) to find the answer to the question the problem asks.

To find how much change Tom's mother got we subtract $2.88 from $5.00 which gives $2.12.

So Tom's mother got $2.12 change.

This is how the work should look.

1. Multiply
$$\begin{array}{r} \$ \ .48 \\ \times 6 \\ \hline \$2.88 \end{array}$$

2. Subtract
$$\begin{array}{r} \$5.00 \\ 2.88 \\ \hline \$2.12 \end{array}$$

There are two steps in each of these problems. Find the answer to the hidden question first. Then use that answer to find the answer to the question the problem asks.

1. Bill had 85¢. He spent 35¢ for a book; 15¢ for a milk-shake; and 8¢ for candy. How much money did he have left?

2. Mary is reading a book which has 240 pages. She has already read 180 pages. How many pages will she have to read each day to finish the book in 4 days?

3. There were 119 persons at the Christmas school concert. It there were 42 boys, 38 girls, and 22 women, and the rest were men, how many men were there at the concert?

TWO-STEP PROBLEMS

4. Eggs were selling at 64¢ a dozen. Allan bought $\frac{1}{2}$ dozen and gave the clerk a $1.00 bill. How much change did he get?

5. Eileen bought 3 pairs of nylon stockings at $1.65 a pair and scarf at $ .75. How much did she spend?

6. Mr. Geddes started out from his home in Eastville to drive his car the 212 miles to Westville. He drove for 5 hours at a speed of 35 miles an hour. How many more miles did he have to drive to get to Westville?

7. Jean was saving her money to buy her mother a sewing basket which cost $3.49. She had saved $ .85 and her father gave her $1.25. How much more did she have to save to buy the sewing basket?

8. Mr. Roden bought 30 gallons of kerosene. After he had sold 67 quarts of it, how many quarts had he left?

9. Rod had $37.25 in the bank. He took out $4.50 to buy a wool sweater. The next week he put $2.10 in the bank. How much did Rod have in the bank then?

10. The ladies made 365 sandwiches for the church picnic and only 345 were served. The sandwiches which were left over were divided evenly among 5 boys. How many sandwiches did each boy get?

11. How much change from a $10.00 bill did Mrs. Green get when she bought 5 yards of cloth at $1.45 a yard?

12. Yesterday, Mr. Dunlop bought 9 gallons of gasoline at $ .43 a gallon. He also paid $1.20 for engine oil and $17.20 for a new tire. How much did he spend?

13. Mr. Steeves had 5 pounds of turnip seed which he sold by the ounce. After he had sold 62 ounces, how many ounces did he have left?

THE MEANING OF AVERAGE

Tess is learning to play the piano. On Monday she practised 50 min.; on Tuesday, 40 min.; on Wednesday, 30 min.; and on Thursday, 60 min. What was the average number of minutes she practised each day?

To find the average number of minutes she practised each day, do two things. (1) Add to find the number of minutes she practised altogether. (2) Divide the total by the number of days she practised.

So Tess practised an average of 45 minutes a day. This does not mean that she practised *exactly* 45 minutes a day. It means that if she had practised the same number of minutes a day she would have practised 45 minutes each day.

Add	*Divide*
50	45
40	4)180
30	16
60	20
180	20

Rule: To find the average of two or more numbers, first ADD the numbers and then DIVIDE the sum by the number of numbers added.

Sometimes the sum or total is given (you don't have to add) *and you are asked to find the average.* For example: If the total weight of 6 pigs is 936 lb., what is the average weight of the pigs? To find the average weight divide 936 by 6.

This does not mean that each pig weighs *exactly* 156 lbs. It means that if all the pigs weighed the same, each pig would weigh 156 lbs.

```
  156
6)936
  6
  33
  30
   36
   36
```

Sometimes, too, only the average is given and you are asked to find the sum or total. For example: On an automobile trip Mr. Fraser drove an average of 235 miles a day. How far did he drive in 5 days?

To find the total number of miles Mr. Smith drove in 5 days multiply 235 by 5 as shown. Again, this does not mean that Mr. Smith drove *exactly* 235 miles each day. It means that if he had driven the same number of miles each day, he would have driven 235 miles each day.

```
 235
 ×5
1175
```

FINDING AVERAGES

1. On his last examination Joe made these marks: English, 75; Arithmetic, 81; Geography, 69; Spelling, 92; and Art, 78. What was Joe's average mark?

2. Elsie has three grand-aunts who are very old. Aunt Jane is 95 years old; Aunt Helen is 87; and Aunt Lucy is 91. What is their average age?

3. Bill is the star player on the school hockey team. He scored 18 goals in 6 games. What was the average number of goals he scored a game?

4. In Miss Kennedy's class there were 28 pupils present on Monday; 27 on Tuesday; 26 on Wednesday; 24 on Thursday; and 25 on Friday. What was the average attendance each day?

5. Leo worked in the summer and earned an average of $3.65 a week. How much did he earn in 8 weeks?

6. The Grade V class had a girl's basketball team. Here are the weights of the 5 girls on the team: 73 lb.; 86 lb.; 94 lb.; 76 lb.; and 81 lb. What is the average weight of the girls on the team?

7. An airplane travelled 2223 miles in 9 hours. What was the average speed of the plane an hour?

8. Mr. Clark made 375 loaves of bread on Monday; 406 on Tuesday; 510 on Wednesday; and 397 on Thursday. What was the average number he baked each day?

9. Mr. Henry raises turkeys. Last week he shipped 65 to a dealer. If the average weight of the turkeys was 12 lb.; what was the total weight of the shipment?

10. Mr. Nanson owns a drugstore. His sales on Monday amounted to $204.50; on Tuesday, $235.60; on Wednesday, $160.75; on Thursday, $301.45; on Friday, $286.20; and on Saturday, $401.80. What were the average sales for each day?

KEEPING THE TOOLS SHARP

Add. Check each answer.

1.

503	954	386	575	409	787
964	647	708	766	624	908
675	203	540	879	998	446
530	429	983	440	605	704
603	874	469	983	846	648
785	335	457	565	653	928

2.

9505	4051	9186	7345	652
2498	9670	8207	573	6407
7304	4392	6065	2430	485
3597	8862	5390	906	9030
6774	4090	8047	6563	962
2653	9364	6630	3685	3275

Subtract. Check each answer.

3.

673	282	828	167	942	384
590	257	379	98	899	86

4.

900	501	700	713	915	300
526	478	503	279	428	208

5.

1434	1817	1756	1600	1483
905	825	887	787	894

6.

6524	9261	9843	7000	6000
2578	3864	4886	4651	562

7.

12539	98261	62058	30002
7867	84942	9526	4965

8.

15142	82340	21234	30026
6476	75453	9389	1369

DIVIDING BY A TWO-FIGURE NUMBER ENDING IN ZERO

Allan is a newsboy. He sells 20 papers a day. How many days will it take him to sell 80 papers?
To find how many days he will take to sell 80 papers we must find how many 20's in 80; that is we must *divide* 80 by 20.

The way to write 20's in 80 is $20\overline{)80}$
We know that $20+20+20+20=80$,

so we see that "*20's in 80 are 4*". Hence $20\overline{)\overset{4}{80}}$

Now that we know the answer we can find a short way to divide by a *two-figure divisor*. We can say, "*2's in 8 are 4, so 20's in 80 are 4*". When we say that, we *think how many times the first figure of the divisor is contained in the first figure of the dividend.* In that way we get the *trial quotient figure.*
The work in dividing 80 by 20 is shown on the left.

$$\begin{array}{r} 4 \\ 20\overline{)80} \\ \underline{80} \end{array}$$

Check:
20 divisor
×4 quotient
80 dividend

Follow these steps:

1. *Divide.* Think, "2's in 8 are 4, so 20's in 80 are 4." Write the 4 over the 0. (We are finding 20's in 80 ones, so the quotient figure 4 goes in the ones' column.)

2. *Multiply* the divisor by the quotient figure. $4\times20=80$. Write the product 80 under the dividend.

3. *Compare.* The product must not be larger than the dividend.

4. *Subtract.* $80-80=0$. Do not write the zero.

So it will take Allan 4 days to sell 80 papers.

Divide. Check each answer.

1.	$20\overline{)60}$	$20\overline{)40}$	$30\overline{)60}$	$40\overline{)80}$	$20\overline{)20}$
2.	$30\overline{)90}$	$60\overline{)60}$	$10\overline{)50}$	$70\overline{)70}$	$10\overline{)80}$

DIVIDING BY A TWO-FIGURE NUMBER ENDING IN ZERO

Mr. Reid got 420 pounds of potatoes from his garden last year. If a bushel of potatoes weighs 60 pounds, how many bushels of potatoes did he raise?

To find how many bushels of potatoes he raised we *divide* 420 by 60.

Follow these steps:

1. *Divide.* 6 is not contained in 4. Think, "6's in 42 are 7, so 60's in 420 are 7." This time we found the trial quotient figure by thinking how many times the first figure of the divisor is contained in the first two figures of the dividend.
Write the 7 over the 0.
2. *Multiply.* $7 \times 60 = 420$
3. *Compare.*
4. *Subtract.* $420 - 420 = 0$.

So Mr. Reid raised 7 bushels of potatoes.

$$\begin{array}{r} 7 \\ 60\overline{)420} \\ \underline{420} \end{array}$$

Check:

$$\begin{array}{r} 60 \\ \times 7 \\ \hline 420 \end{array}$$

Divide. Check each answer.

1.	$20\overline{)140}$	$30\overline{)120}$	$40\overline{)240}$	$50\overline{)250}$	$60\overline{)360}$
2.	$30\overline{)150}$	$20\overline{)100}$	$60\overline{)180}$	$70\overline{)350}$	$80\overline{)320}$
3.	$90\overline{)270}$	$40\overline{)320}$	$80\overline{)400}$	$60\overline{)480}$	$50\overline{)450}$
4.	$80\overline{)640}$	$90\overline{)540}$	$70\overline{)490}$	$40\overline{)360}$	$80\overline{)560}$
5.	$50\overline{)400}$	$80\overline{)720}$	$60\overline{)240}$	$90\overline{)630}$	$70\overline{)420}$
6.	$30\overline{)270}$	$40\overline{)280}$	$90\overline{)720}$	$80\overline{)480}$	$20\overline{)180}$
7.	$60\overline{)300}$	$90\overline{)810}$	$70\overline{)560}$	$60\overline{)540}$	$70\overline{)630}$

8. Nora is reading a book which has 240 pages. If she reads 30 pages a day, how long will it take her to finish the book?

DIVIDING BY A TWO-FIGURE NUMBER NOT ENDING IN ZERO

How many rows of chairs can be made with 96 chairs if 32 chairs are put in each row?

To find how many rows can be made we *divide* 96 by 32.

```
   3
32)96
   96
```

There are about as many 32's in 96 as there are 3's in 9.

Follow these steps:

1. *Divide.* Think, "3's in 9 are 3, so 32's in 96 are 3." Write the 3 over the 6.
2. *Multiply.* $3 \times 32 = 96$.
3. *Compare.* The product must not be larger than the dividend.
4. *Subtract.* $96 - 96 = 0$.

So 3 rows of chairs can be made.

Check:

```
 32
×3
---
 96
```

Divide 219 by 73

```
   3
73)219
   219
```

Since the first figure of the divisor is larger than the first figure of the dividend, *use the first two figures of the dividend.* To find 73's in 219, think, "7's in 21 are 3".

Divide. Check each answer.

1.	$42\overline{)84}$	$23\overline{)69}$	$32\overline{)64}$	$41\overline{)82}$	$22\overline{)66}$
2.	$12\overline{)48}$	$13\overline{)39}$	$14\overline{)28}$	$43\overline{)86}$	$31\overline{)93}$
3.	$21\overline{)189}$	$42\overline{)168}$	$63\overline{)189}$	$81\overline{)729}$	$54\overline{)108}$
4.	$71\overline{)426}$	$53\overline{)159}$	$91\overline{)819}$	$82\overline{)328}$	$63\overline{)126}$
5.	$41\overline{)369}$	$92\overline{)368}$	$51\overline{)357}$	$62\overline{)248}$	$91\overline{)637}$
6.	$94\overline{)188}$	$51\overline{)459}$	$82\overline{)246}$	$91\overline{)728}$	$73\overline{)146}$

7. If a chair costs \$52, how many such chairs will \$208 buy?

DIVIDING WHEN THE FIRST FIGURE OF THE DIVISOR DOES NOT DIVIDE EVENLY INTO THE FIRST OR INTO THE FIRST TWO FIGURES OF THE DIVIDEND

Frequently, when dividing by a two-figure divisor, the first figure of the divisor does not divide evenly into the first or into the first two figures of the dividend. In such cases, *find the first number less than the first or the first two figures of the dividend,* and find how many times the first figure of the divisor will divide into it. You then have the *trial quotient figure.*

1. *Divide.* 7 does not divide evenly into 59. The first number less than 59 into which 7 divides evenly is 56. 7's in 56 are 8, so 7's in 59 are 8. Then 74's in 592 are 8. Write the 8 over the 2.

2. *Multiply.* **3.** *Compare.* **4.** *Subtract.*

Divide 592 by 74

```
   8
74)592
   592
```

Check:

```
  74
 ×8
 592
```

Divide. Check each answer.

1.	$24\overline{)96}$	$45\overline{)90}$	$23\overline{)92}$	$35\overline{)70}$	$25\overline{)75}$
2.	$32\overline{)192}$	$54\overline{)216}$	$63\overline{)441}$	$45\overline{)225}$	$83\overline{)581}$
3.	$73\overline{)657}$	$94\overline{)752}$	$52\overline{)416}$	$23\overline{)138}$	$65\overline{)390}$
4.	$62\overline{)434}$	$54\overline{)486}$	$85\overline{)680}$	$92\overline{)828}$	$75\overline{)525}$
5.	$84\overline{)588}$	$62\overline{)496}$	$42\overline{)378}$	$73\overline{)511}$	$35\overline{)175}$
6.	$55\overline{)440}$	$93\overline{)651}$	$32\overline{)288}$	$44\overline{)308}$	$74\overline{)666}$
7.	$43\overline{)258}$	$85\overline{)765}$	$75\overline{)600}$	$64\overline{)384}$	$94\overline{)470}$

8. It was Roy's birthday and his mother gave a birthday party for him. She made 165 cookies for the party. If there were 33 boys at the party, how many cookies did each boy get if each got the same number of cookies?

DIVIDING BY A TWO-FIGURE NUMBER WITH A REMAINDER

Mr. Fraser makes bread for an army camp. He ships the bread in boxes with 72 loaves in each box. Yesterday he made 381 loaves of bread. How many boxes did he fill and how many loaves were left over?

$$\begin{array}{r} 5R21 \\ 72\overline{)381} \\ \underline{360} \\ 21 \end{array}$$

To find how many boxes he filled and how many loaves were left over, we divide 381 by 72.

1. *Divide.* Think, "7's in 38 are 5, so 72's in 381 are 5." Write the 5 over the 1.
2. *Multiply.* $5 \times 72 = 360$
3. *Compare.*
4. *Subtract.* $381 - 360 = 21$
5. *Compare.* *The remainder must be less than the divisor.*

So Mr. Fraser filled 5 boxes and he had 21 loaves left over.

Check:

$$\begin{array}{r} 72 \\ \times 5 \\ \hline 360 \\ +21 \\ \hline 381 \end{array}$$

Divide. Check each answer.

1.	$30\overline{)64}$	$20\overline{)89}$	$30\overline{)95}$	$40\overline{)87}$	$20\overline{)66}$	$50\overline{)58}$
2.	$40\overline{)206}$	$70\overline{)285}$	$60\overline{)307}$	$90\overline{)545}$	$80\overline{)564}$	
3.	$23\overline{)49}$	$31\overline{)97}$	$43\overline{)88}$	$61\overline{)307}$	$92\overline{)189}$	
4.	$52\overline{)158}$	$72\overline{)219}$	$31\overline{)187}$	$91\overline{)368}$	$82\overline{)167}$	
5.	$73\overline{)451}$	$64\overline{)275}$	$82\overline{)670}$	$54\overline{)382}$	$95\overline{)886}$	
6.	$42\overline{)344}$	$75\overline{)691}$	$93\overline{)687}$	$64\overline{)522}$	$82\overline{)469}$	
7.	$81\overline{)407}$	$63\overline{)451}$	$52\overline{)473}$	$94\overline{)596}$	$72\overline{)398}$	

8. A bricklayer ordered 440 bricks to build a fence. If he puts 82 bricks in each layer, how many layers high will the fence be, and how many bricks will be left over?

PERSONAL ACCOUNTS

One of the hardest jobs some people have is to look after their money properly. Too often they spend their money foolishly. Your money should be used wisely.

The best way to make sure you use your money wisely is to keep a *personal account* of what money you get and of what money you pay out.

To keep his personal account for May, George ruled a page of a note-book as shown below.

Cash Received					Cash Paid Out				
May	1	Carried forward		45	May	4	bottle of ink		15
"	2	Allowance		25	"	10	book		45
"	6	Cleaning cellar		20	"	14	ice-cream		15
"	9	Allowance		25	"	17	movie		20
"	12	Baby sitting		50	"	23	fishing rod	1	20
"	16	Allowance		25					
"	23	Allowance		25			Total	2	15
"	27	Mowing lawn		35					
"	30	Allowance		25					
		Total	2	75					
June	1	Carried forward		60					

On the left under "Cash Received" he entered the dates, how he got the money, and the amounts he received. The first item on May 1, "Carried forward" means the amount of cash he had on May 1.

On the right under "Cash Paid Out" he entered the dates, what he spent the money on, and the amounts he paid out.

At the end of May, George *balanced* his account; that is, he added the amounts he received during the month and the amounts he paid out. He subtracted the total amount paid out ($2.15) from the total amount he received ($2.75) and he had a *balance* of 60¢.

Then George started his personal account for June by carrying forward this balance as shown by the entry for June 1.

PERSONAL ACCOUNTS

Rule out in your note-book a form like the one on page 74 and make out the personal accounts below.

1. Rita's personal account for the month of September.

Cash Received		*Cash Paid Out*	
Sept. 1 Carried forward	$1.10	Sept. 3 Scarf	$ .39
Sept. 5 Allowance	.30	Sept. 6 Movie	.20
Sept. 10 For old skates	1.25	Sept. 11 Stockings	.75
Sept. 12 Allowance	.30	Sept. 17 Ice-cream	.15
Sept. 16 Errand	.15	Sept. 21 Girls' Magazine	.20
Sept. 23 Baby sitting	.40	Sept. 29 Present for father	1.45
Sept. 26 Allowance	.30		

How much was Rita's balance on September 30?

---

2. Sandy's personal account for the month of January.

Cash Received		*Cash Paid Out*	
Jan. 2 Carried forward	$ .85	Jan. 5 Hockey stick	$ .75
Jan. 4 Allowance	.25	Jan. 8 Church collection	.25
Jan. 8 Shovelling snow	.65	Jan. 13 Pencil	.05
Jan. 11 Allowance	.25	Jan. 19 Movie	.20
Jan. 15 Birthday present	2.50	Jan. 24 Sweater	3.25
Jan. 18 Allowance	.25	Jan. 30 Note-book	.15
Jan. 23 Errand	.15		
Jan. 25 Allowance	.25		

How much was Sandy's balance on January 31?

3. Start now to keep a personal account of your own.

Be sure to balance your account at the end of each month.

DIVISION BY A 2-FIGURE NUMBER WITH CARRYING

If a car holds 32 tons of coal, how many cars will be needed to move 736 tons of coal?
To find how many coal-cars are needed we *divide* 736 by 32.

Follow these steps:

1. *Divide.* The first figure of the divisor divides into the first figure of the dividend, so the *first partial dividend* is 73.
Think, "3's in 7 are 2, so 32's in 73 are 2." Write the 2 over the 3, the last figure of the partial dividend.
(73 in 736 means 73 tens, so the quotient figure is placed in the tens' column.)

```
  23
32)736
  64
  96
  96
```

2. *Multiply.* 2 x 32 = 64. Write the 64 under 73.

3. *Compare.* The product must not be larger than the partial dividend.

4. *Subtract.* 73 − 64 = 9.

5. *Compare.* The remainder must be less than the divisor.

6. *Bring down* the 6 and place it under the 6 and next to the 9. *The second partial dividend is* 96.

Check:

```
 32
x23
 96
64
736
```

7. REMEMBER *that when a figure is brought down from the dividend a figure must be placed above it in the quotient.*

Start at step 1 again and find 32's in 96.

1. *Divide. Think, "3's in 9 are 3, so 32's in 96 are 3." Write the 3 over the 6, the last figure of the partial dividend, 96.*

2. *Multiply.* **3.** *Compare.* **4.** *Subtract.*

There is no remainder. So 23 coal-cars are needed.

Follow steps 1 to 7 and repeat them to explain how this exercise is done. This exercise has a *remainder.*

```
   41 R3
24)987
   96
   27
   24
    3
```

Check:

```
 24
 41
 24
 96
984
+ 3
987
```

DIVIDING BY A 2-FIGURE NUMBER WITH CARRYING

Divide. Check each exercise. Some exercises have remainders, others have no remainders.

1.	$20\overline{)260}$	$30\overline{)630}$	$60\overline{)660}$	$30\overline{)967}$	$20\overline{)843}$
2.	$40\overline{)840}$	$20\overline{)485}$	$30\overline{)690}$	$70\overline{)770}$	$30\overline{)998}$
3.	$21\overline{)882}$	$12\overline{)396}$	$32\overline{)997}$	$53\overline{)589}$	$71\overline{)787}$
4.	$24\overline{)555}$	$41\overline{)887}$	$31\overline{)682}$	$51\overline{)564}$	$63\overline{)697}$
5.	$12\overline{)384}$	$14\overline{)298}$	$54\overline{)597}$	$33\overline{)368}$	$23\overline{)483}$
6.	$81\overline{)899}$	$22\overline{)748}$	$53\overline{)601}$	$21\overline{)305}$	$43\overline{)903}$
7.	$32\overline{)704}$	$73\overline{)825}$	$24\overline{)992}$	$61\overline{)703}$	$12\overline{)492}$
8.	$52\overline{)595}$	$31\overline{)713}$	$82\overline{)902}$	$21\overline{)693}$	$43\overline{)905}$

9. Bill's father is a commercial traveller. When he got home last week he told Bill he had travelled 651 miles and that he used 31 gallons of gasoline on the trip. How many miles did he average to the gallon?

10. If a train averages 42 miles an hour, how many hours will this train take to travel 462 miles?

11. Tom got a job in a canning factory last summer. One day the boss told him to pack 984 cans of apple-juice in boxes. If each box held 24 cans, how many boxes did Tom use?

12. Last week Elsie gathered 372 eggs from the hen-house. How many dozen eggs did she gather?

13. Alvin Smith was having his oats threshed. On one wagon the oats weighed 748 lb. If a bushel of oats weighs 34 pounds, how many bushels were on the wagon?

KEEPING THE TOOLS SHARP

Add. Check each answer.

1.	7654	2577	4946	8365	7398
	4065	5638	9597	6279	5743
	8876	6776	6804	4554	9575
	6340	3354	4369	8607	7860
	8583	5989	5733	6452	3692
	6498	6826	2755	8287	7366
2.	5869	6995	7286	7887	4945
	7738	5367	2038	4424	5296
	4555	3044	9386	9798	9074
	3394	7958	6463	7889	7845
	7229	3495	7269	4453	6670
	9445	3263	4128	9382	3892

Subtract Check each answer.

3.	1351	1785	1424	1236	1462
	763	799	957	998	566
4.	1260	1160	1500	8000	1301
	337	886	673	3529	706
5.	9361	4346	5348	8524	7345
	5965	2398	3549	7785	6487

6.	62718	84527	19595	94824
	47266	26059	14597	84848
7.	50005	92020	30500	40206
	1496	32096	26857	30809
8.	80153	51347	66201	12444
	43497	45868	29007	6069

DIVISION BY A 2-FIGURE NUMBER WITH CARRYING

A passenger train averages 43 miles an hour. How many hours will it take this train to travel 1505 miles?
To find how many hours the train will take we *divide* 1505 by 43.
Follow these steps:

```
      35
43)1505
   129
   215
   215
```

1. *Divide. The first figure of the divisor divides into the first two figures of the dividend,* so the *first partial dividend* is 150. Think, "4's in 15 are 3, so 43's in 150 are 3." Write the 3 over the 0, *the last figure of the partial dividend.* (150 in 1505 means 150 tens, so the quotient figure 3 is placed in the tens' column.)

Check:

```
  43
 x35
 215
129
1505
```

2. *Multiply.* $3 \times 43 = 129$. Write the 129 under 150.

3. *Compare.* The product must be less than the partial dividend.

4. *Subtract.* $150 - 129 = 21$.

5. *Compare.* The remainder must be less than the divisor.

6. *Bring down* the 5 and place it under the 5 and next to the 21. The *second partial dividend* is 215.

7. REMEMBER *that when a figure is brought down from the dividend a figure must be placed above it in the quotient.*

Start at Step 1 and find 43's in 215.

1. *Divide.* Think, "4's in 21 are 5, so 43's in 215 are 5." Write the 5 over the 5, *the last figure of the partial dividend,* 215.

2. *Multiply.* **3.** *Compare.* **4.** *Subtract.*

There is no remainder. So the train will take 35 hours.

Follow Steps 1 to 7 and repeat them to explain how this exercise is done. *This exercise has a remainder.*

```
   42 R6
52)2190
  208
  110
  104
    6
```

Check:

```
  52
 x42
 104
208
2184
   6
2190
```

DIVISION BY A 2-FIGURE NUMBER WITH CARRYING

Divide. Check each answer. Some exercises have remainders; others have no remainders.

1.	$30\overline{)1710}$	$40\overline{)3375}$	$50\overline{)4756}$	$60\overline{)5652}$	$80\overline{)4320}$
2.	$21\overline{)1386}$	$41\overline{)1753}$	$61\overline{)2015}$	$51\overline{)3342}$	$31\overline{)1767}$
3.	$42\overline{)3916}$	$54\overline{)3966}$	$82\overline{)3444}$	$44\overline{)1990}$	$72\overline{)3760}$
4.	$63\overline{)4612}$	$53\overline{)2809}$	$64\overline{)2908}$	$32\overline{)1472}$	$71\overline{)6147}$
5.	$43\overline{)3569}$	$52\overline{)3368}$	$83\overline{)2079}$	$72\overline{)5286}$	$65\overline{)3402}$
6.	$34\overline{)1478}$	$63\overline{)1701}$	$72\overline{)1728}$	$42\overline{)3080}$	$82\overline{)3854}$
7.	$55\overline{)3475}$	$92\overline{)2392}$	$42\overline{)3570}$	$83\overline{)6159}$	$54\overline{)1944}$
8.	$43\overline{)3150}$	$85\overline{)1984}$	$73\overline{)4088}$	$34\overline{)1472}$	$72\overline{)6142}$
9.	$65\overline{)2231}$	$44\overline{)2376}$	$94\overline{)8772}$	$63\overline{)3599}$	$84\overline{)5376}$
10.	$33\overline{)2097}$	$51\overline{)2397}$	$34\overline{)1428}$	$41\overline{)1867}$	$32\overline{)1120}$

11. Fred Warner is a bus driver. Last month he made 34 trips and carried 1462 passengers. What was the average number of passengers carried each trip?

12. Mr. Doyle went on a long auto trip of 1782 miles. If he drove an average of 33 miles an hour, how many hours did he drive on his trip?

13. A co-operative shipped 54 dressed lambs to the market. If the total weight of the shipment was 2268 pounds, what was the average weight of the lambs?

OCEAN TRAVEL

One of the largest passenger ships afloat is the Queen Mary. She makes many trips a year between Great Britain and North America.

1. The length of the Queen Mary from bow to stern is 1019 ft. How many feet longer is she than a fishing schooner which is 137 feet long?

2. The Queen Mary can carry 720 cabin-class passengers, 850 first-class passengers, and 744 tourist-class passengers. How many passengers can she carry?

3. If the Queen Mary has a crew of 826, how many people can she carry each trip? (Use answer to Question 2).

4. There are 325 cabin-class rooms on the Queen Mary; 500 first-class rooms; and 250 tourist-class rooms. How many rooms for passengers are there on the ship?

5. If the cost of a one-way trip, including meals, on the Queen Mary was $165 for tourist-class and $250 for cabin-class, how much less would it cost to travel tourist-class than cabin-class?

6. On one trip the Queen Mary travelled from Britain to the United States a distance of 2976 miles in 93 hours. What was the average speed an hour?

BE SURE THE QUOTIENT FIGURE IS CORRECT

Up until now all the 2-figure divisors you have been using, like 21, 34, etc., have ended in 0, 1, 2, 3, 4, or 5. You have been finding the *trial quotient figure* by finding *how many times the first figure of the divisor is contained in the first or the first two figures of the dividend or partial dividend.* In most cases this way of finding the correct quotient figure works—but in many cases it *does not work.* Look at the examples below.

Divide 82 by 43.

1. *Divide.* Think, "4's in 8 are 2, so 43's in 82 are 2."
2. *Multiply.* $2 \times 43 = 86$
3. *Compare.* *The product must not be larger than the dividend.*

But 86 is larger than 81, so the quotient figure 2 is *too large.*

Try the next smaller figure, 1, as the quotient figure. It works.

Too large

$$\begin{array}{r} 2 \leftarrow \text{WRONG} \\ 43\overline{)82} \\ \underline{86} \leftarrow \\ \end{array}$$

Correct

$$\begin{array}{r} 1 \\ 43\overline{)82} \\ \underline{43} \\ 39 \end{array}$$

Divide 164 by 23.

1. *Divide.* Think, "2's in 16 are 8, so 23's in 164 are 8."
2. *Multiply.* $8 \times 23 = 184$
3. *Compare.* *The product must not be larger than the dividend.*

But 184 is larger than 164, so the quotient figure 8 is *too large.*

Try the next smaller figure, 7, as the quotient figure. It works.

Too large

$$\begin{array}{r} 8 \leftarrow \text{WRONG} \\ 23\overline{)161} \\ \underline{184} \leftarrow \\ \end{array}$$

Correct

$$\begin{array}{r} 7 \\ 23\overline{)164} \\ \underline{161} \\ 3 \end{array}$$

Always compare the product with the dividend or partial dividend. If the quotient figure is too large, try the next smaller figure. If it doesn't work, try the next smaller figure, etc.

Divide. Check each answer. Watch the quotient figures.

1. $24\overline{)85}$ $34\overline{)97}$ $41\overline{)160}$ $63\overline{)184}$ $52\overline{)253}$

BE SURE THE QUOTIENT FIGURE IS CORRECT

When George Grey weighed the oats he threshed he found he had 952 lb. If a bushel of oats weighs 34 lb., how many bushels of oats did he have?

To find how many bushels of oats he had we *divide* 952 by 34.

```
   28
34)952
   68
  272
  272
```

1. *Divide.* To find 34's in 95, think, "3's in 9 are 3."
2. *Multiply.* $3 \times 34 = 102$
3. *Compare.* The product 102 is larger than the partial dividend 95, so the quotient figure 3 is too large. *Try 2 as the quotient figure.* Multiply and compare. 2 is correct.

```
Check:
  34
 ×28
 272
  68
 952
```

4. *Subtract.* $95 - 68 = 27$.
5. *Compare,* The remainder must be less than the divisor.
6. *Bring down* the 2.
7. REMEMBER that when a figure is brought down from the dividend a figure must be placed above it in the quotient.

Start at Step 1 and find 34's in 272.

1. *Divide.* Think, "3's in 27 are 9, so 34's in 272 are 9."
2. *Multiply.* $9 \times 34 = 306$.
3. *Compare.* The product 306 is larger than the partial dividend 272, so the quotient figure 9 is too large. Try 8. It works.
4. *Subtract.* $272 - 272 = 0$.

So George Grey has 28 bushels of oats.

After a little practice you will often be able to see at a glance that the first trial quotient figure you think of will not work, so you won't even write it. You will write the correct quotient figure the first time.

Divide. Check each answer. Watch the quotient figures.

1. $33\overline{)288}$ $65\overline{)502}$ $84\overline{)491}$ $54\overline{)310}$ $75\overline{)296}$

BE SURE THE QUOTIENT FIGURE IS CORRECT

Divide. Check each answer.

1.	$24\overline{)672}$	$12\overline{)576}$	$32\overline{)924}$	$44\overline{)817}$	$35\overline{)910}$
2.	$72\overline{)3517}$	$63\overline{)3077}$	$11\overline{)536}$	$42\overline{)3603}$	$23\overline{)1081}$
3.	$31\overline{)2105}$	$53\overline{)1521}$	$33\overline{)617}$	$25\overline{)1350}$	$44\overline{)3338}$
4.	$43\overline{)806}$	$23\overline{)1724}$	$84\overline{)6625}$	$24\overline{)1106}$	$35\overline{)2584}$
5.	$34\overline{)938}$	$65\overline{)2515}$	$23\overline{)1922}$	$35\overline{)1610}$	$44\overline{)2136}$
6.	$83\overline{)7301}$	$25\overline{)1175}$	$55\overline{)3124}$	$23\overline{)1994}$	$73\overline{)5026}$
7.	$54\overline{)4139}$	$93\overline{)4536}$	$23\overline{)1541}$	$64\overline{)1823}$	$24\overline{)1572}$
8.	$53\overline{)4605}$	$95\overline{)3681}$	$24\overline{)1748}$	$45\overline{)2513}$	$63\overline{)4271}$
9.	$35\overline{)2580}$	$43\overline{)3689}$	$14\overline{)784}$	$13\overline{)728}$	$15\overline{)540}$

10. A case of pop holds 24 bottles. How many cases can be filled with 912 bottles of pop?

11. The Stevens family pay $35 a month rent for their house. So far they have paid $630. How many months have they lived in that house?

12. Last month Mr. Glassey took in $1260 from the sale of winter overcoats. If the overcoats sold for $45 each, how many overcoats did he sell?

13. How many boxes are needed to ship 4248 cans of sardines if there are 72 cans to a box?

14. The Boy Scouts collected 600 old newspapers last Saturday. If they tied them in bundles of 25 how many bundles did they have?

15. If a train travels at an average speed of 45 mi. an hour, how long will it take to go 1665 mi.?

ROMAN NUMERALS

The figures that we use every day—1, 2, 3, 4, 5, 6, 7, 8, 9, 0 are called *Arabic* figures because we got them from the Arabs. The Romans, who lived a long time ago used letters to stand for numbers. They used 7 letters: I, V, X, L, C, D, and M. These are called *Roman numerals.*

We still use Roman numerals today on old clocks, for chapters in books, for grades in school, for numbering sets of books, and for writing the dates on corner stones of buildings.

All the numbers the Romans used were made by using the seven letters with the values shown below.

I	V	X	L	C	D	M
1	5	10	50	100	500	1000

It is easy to write Roman numerals if you remember three rules:

1. *When a letter is repeated add its value to get the number.* III = 3; XX = 20; MMM = 3000.

2. *When a letter of smaller value is written after a letter of larger value add the two values.* VII = 7; XV = 15; DC = 600

3. *When a letter of smaller value is written before a letter of larger value subtract the two values.* IX = 9; XL = 40; CM = 900

1. Read these Roman numerals: VIII, XVI, XXIV, XXXIX, CLII, CCXXV, CDX, DCL, MCCX.

2. Write in Roman numerals: 14, 28, 57, 85, 92, 366, 571, 843, 1055, 1876, 1914.

3. Read these sentences:

(a) I am reading Chapter XXIV of this book.
(b) You will find it in Volume XIX of the encyclopedia.
(c) The printer charged $6.50 per M for the cards.
(d) The corner stone of our school building was laid in MCMXXXVI.
(e) World War II ended in MCMXLV.

DIVISION BY A 2-FIGURE NUMBER ENDING IN 6, 7, 8, OR 9

When dividing by a two-figure number ending in 6, 7, 8, or 9, a *little common sense* will usually help us to find the correct quotient figure the first time. Look at the example.

Divide 92 by 26.

1. *Divide.* Think, "2's in 9 are 4."

2. *Multiply.* $4 \times 26 = 104$.

3. *Compare.* The product, 104, is larger than the dividend, 92; so the quotient figure, 4, is too large. If you try the next smaller number, 3, as the quotient figure it will be correct.

Too large

$$\begin{array}{r} 4 \leftarrow \text{WRONG} \\ 26\overline{)92} \\ 104 \leftarrow \end{array}$$

But a little common sense will give us the correct quotient figure the first time we try. Let us see how.

The divisor, 26, is nearer 30 than it is to 20, so there are probably as many 26's in 92 as there are 30's in 92. To find 26's in 92, think of the 2 of 26 as a 3. Now let us try.

1. *Divide.* There are about as many 26's in 92 as there are 3's in 9. Think, "3's in 9 are 3."

2. *Multiply.* $3 \times 26 = 78$.

3. *Compare.* 78 is not larger than 92.

4. *Subtract.* $92 - 78 = 14$.

5. *Compare.* The remainder is less than the divisor.

Correct

$$\begin{array}{r} 3 \\ 26\overline{)92} \\ 78 \\ \hline 14 \end{array}$$

When dividing by a two-figure number ending in 6, 7, 8, or 9, estimate the trial quotient figure by using the figure which is one greater than the first figure of the divisor. This rule usually, but not always, holds true.

Divide. Check each answer.

1.	$36\overline{)97}$	$27\overline{)95}$	$38\overline{)64}$	$29\overline{)80}$	$48\overline{)86}$
2.	$29\overline{)152}$	$56\overline{)261}$	$49\overline{)175}$	$67\overline{)374}$	$77\overline{)365}$
3.	$36\overline{)132}$	$68\overline{)443}$	$96\overline{)551}$	$98\overline{)462}$	$89\overline{)472}$

DIVISION BY A 2-FIGURE NUMBER ENDING IN 6, 7, 8, OR 9 WITH CARRYING

A creamery has 2173 lb. of butter for shipment. If the butter is put in boxes with 48 lb. to a box, how many boxes are needed for the shipment?

$$\begin{array}{r} 45R13 \\ 48\overline{)2173} \\ 192 \\ \hline 253 \\ 240 \\ \hline 13 \end{array}$$

To find how many boxes are needed we divide 2173 by 48.

Since the divisor 48 ends in 8, think of the 4 as a 5.

The first partial dividend is 217.

1. *Divide.* Think, "5's in 21 are 4."
2. Multiply. $4 \times 48 = 192$
3. Compare.
4. Subtract. $217 - 192 = 25$
5. *Compare.* The remainder must be less than the divisor.
6. *Bring down* the 3.
7. REMEMBER a figure must go above the 3 in the quotient.

The second partial dividend is 253.

1. *Divide.* Think, "5's in 25 are 5." Write the 5 over the 3.

Multiply, Compare, Subtract, Compare.

So 45 boxes were needed and there were 13 lb. of butter left over.

Check:

$$\begin{array}{r} 45 \\ 48 \\ \hline 360 \\ 180 \\ \hline 2160 \\ +13 \\ \hline 2173 \end{array}$$

Divide. Check each answer.

1.	$37\overline{)860}$	$28\overline{)712}$	$36\overline{)524}$	$57\overline{)996}$	$26\overline{)411}$
2.	$29\overline{)504}$	$38\overline{)890}$	$49\overline{)803}$	$27\overline{)609}$	$39\overline{)941}$
3.	$47\overline{)2510}$	$28\overline{)1023}$	$56\overline{)3720}$	$79\overline{)5147}$	$37\overline{)2101}$
4.	$86\overline{)3629}$	$67\overline{)4322}$	$78\overline{)5073}$	$58\overline{)4370}$	$87\overline{)2402}$

5. Bob has 651 stamps for his new album. If he puts 28 stamps on each page, how many pages will he fill and how many stamps will be left over for another page?

BE SURE THE QUOTIENT FIGURE IS CORRECT

Sometimes, when a two-figure divisor ends in 6, 7, 8, or 9, the rule you learned on page 86 does not work. Look at the example.

Divide 115 by 28

1. *Divide,* Think, "3's in 11 are 3."
2. *Multiply.* $3 \times 28 = 84$
3. *Compare.* It looks correct.
4. *Subtract.* $115 - 84 = 31$
5. *Compare.* *The remainder must be less than the divisor.* But the remainder, 31, is larger than the divisor, 28. Hence 28's in 115 are more than 3.

Try the next higher figure, 4, as the quotient figure. It works.

Always compare the remainder with the divisor. If the quotient figure is too small, try the next higher figure.

Incorrect

$$\begin{array}{r} 3 \leftarrow \\ 28\overline{)115} \\ 84 \leftarrow \\ \hline 31 \leftarrow \end{array}$$

Wrong

Correct

$$\begin{array}{r} 4 \\ 28\overline{)115} \\ 112 \\ \hline 3 \end{array}$$

Divide. Check each answer.

1. $37\overline{)193}$ $29\overline{)118}$ $48\overline{)294}$ $66\overline{)330}$ $39\overline{)314}$

2. $28\overline{)199}$ $77\overline{)622}$ $89\overline{)445}$ $56\overline{)517}$ $26\overline{)190}$

3. $38\overline{)232}$ $78\overline{)468}$ $47\overline{)335}$ $87\overline{)699}$ $69\overline{)483}$

4. $27\overline{)1485}$ $38\overline{)2394}$ $48\overline{)4464}$ $26\overline{)1664}$

5. $36\overline{)1878}$ $87\overline{)5398}$ $76\overline{)6992}$ $37\overline{)2368}$

6. $67\overline{)3484}$ $47\overline{)2967}$ $59\overline{)5379}$ $28\overline{)1795}$

7. An ice-man had a load of 3472 lb. of ice on his truck. If each block of ice weighed 56 lb., how many blocks were there in the load?

8. Thomas Lynn sold 39 lambs to the market. If the total weight of the lambs was 2379 lb., what was the average weight of the lambs?

KEEPING THE TOOLS SHARP

Add. Check each answer.

1.	7945	5796	5054	4505	9456
	3485	8877	6103	7477	3768
	8902	4622	2096	3744	7604
	1266	6509	8261	8888	3490
	5550	9842	3020	3543	8609
	4771	7477	9286	4389	7434

Subtract. Check each answer.

	9843	8500	1324	1940	4000
2.	4886	5065	945	996	2452

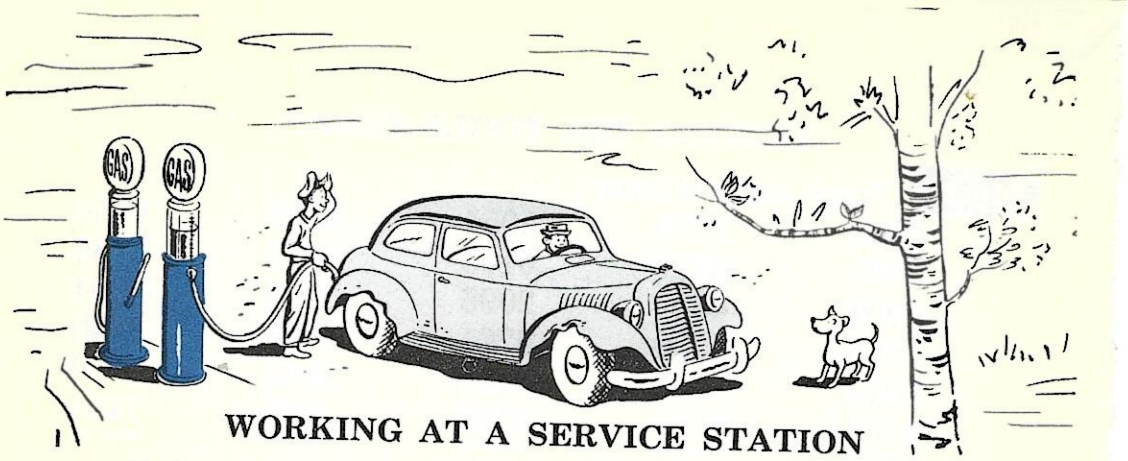
3.	51733	13761	26474	30008
	49385	5958	7977	5219

Multiply. Check each answer.

4.	70	98	672	306	548	819
	53	87	94	56	395	106

Divide. Check each answer.

5.	$52\overline{)208}$	$73\overline{)438}$	$34\overline{)78}$	$23\overline{)97}$	$91\overline{)563}$
6.	$23\overline{)124}$	$52\overline{)410}$	$48\overline{)93}$	$68\overline{)263}$	$96\overline{)352}$
7.	$36\overline{)266}$	$97\overline{)698}$	$28\overline{)171}$	$59\overline{)359}$	$48\overline{)192}$
8.	$83\overline{)3735}$	$65\overline{)1771}$	$93\overline{)3348}$	$54\overline{)1908}$	
9.	$92\overline{)5357}$	$73\overline{)4898}$	$84\overline{)2308}$	$63\overline{)4536}$	
10.	$85\overline{)6523}$	$43\overline{)1628}$	$35\overline{)2926}$	$94\overline{)6495}$	
11.	$68\overline{)3295}$	$89\overline{)3744}$	$47\overline{)1510}$	$28\overline{)1902}$	
12.	$59\overline{)3789}$	$98\overline{)4245}$	$76\overline{)6992}$	$26\overline{)1906}$	



WORKING AT A SERVICE STATION

Bob works at his father's garage after school and on Saturdays. Here are problems he had to do at his work.

1. Mr. Black drove his car up to the gasoline tank and said, "Give me 9 gallons of gas, Bob." If the gasoline was $ .42 a gallon, how much change did Mr. Black get if he paid for the gasoline with a $5 bill?

2. Mr. Evans paid Bob $1.50 for having his car greased and 45¢ a quart for 6 quarts of motor oil. How much did Mr. Evans pay altogether?

3. Bob sold 8 spark plugs to a customer and charged him $3.44 for them. How much did each plug cost?

4. Mr. Adams was getting his car ready for winter driving. Bob sold him a battery for $16.65 and 3 gallons of anti-freeze at $2.85 a gallon. How much did Mr. Adams pay Bob?

5. One of Bob's customers went on a trip. When he left his car had registered 2979 miles and when he got back his car registered 3617 miles. How many miles did he drive on his trip?

6. Mr. Graham bought 52 gallons of gasoline in July and drove his car 988 miles during the month. What was his average number of miles per gallon?

7. Bob's father pays him $ .35 an hour. If Bob worked 72 hours last month and kept $5.00 out of his pay for pocket money, how much did he save?

DIVISION BY THE "TEENS"

The "teens" numbers, that is, the numbers from 13 to 19 are tricky when they are divisors. It may take a little longer to find the correct quotient figure when dividing by the teens. Sometimes you may have to try several quotient figures before you find the correct one. Sometimes the quotient figure you try will be correct; sometimes it will be too small; other times it will be too large. Keep working until you find the correct quotient figure. With practice you will learn to find the correct quotient figure the first time. Study the example.

First Trial

Incorrect

$$\begin{array}{r} 5 \\ 17\overline{)119} \\ 85 \\ \hline 34 \end{array}$$

Second Trial

Incorrect

$$\begin{array}{r} 6 \\ 17\overline{)119} \\ 102 \\ \hline 17 \end{array}$$

Third Trial

Correct

$$\begin{array}{r} 7 \\ 17\overline{)119} \\ 119 \\ \hline \end{array}$$

Since the divisor 17 ends in 7 think of the 1 as 2 and use 2 as the trial divisor.
Divide. Think, "2's in 11 are 5."
Multiply. $5 \times 17 = 85$
Compare. It looks correct.
Subtract. $119 - 85 = 34$
Compare. The remainder 34 is larger than the divisor 17, so there are more 17's in 119 than 5.
Try 6 as the quotient figure. Why is 6 too small?
Try 7 as the quotient figure. Why is 7 correct?

Divide. Check each answer.

1. $13\overline{)84}$ $14\overline{)56}$ $16\overline{)108}$ $15\overline{)92}$ $17\overline{)85}$ $19\overline{)115}$

2. $13\overline{)75}$ $16\overline{)98}$ $19\overline{)59}$ $18\overline{)86}$ $17\overline{)135}$ $18\overline{)153}$

3. $14\overline{)652}$ $13\overline{)429}$ $18\overline{)780}$ $17\overline{)1141}$ $15\overline{)480}$

4. $16\overline{)1052}$ $19\overline{)1311}$ $15\overline{)885}$ $14\overline{)518}$ $19\overline{)517}$

5. $14\overline{)990}$ $13\overline{)695}$ $17\overline{)213}$ $18\overline{)356}$ $16\overline{)993}$

6. How many pecks are there in 765 lb. of potatoes if a peck of potatoes weighs 15 lb?

9 IS THE LARGEST QUOTIENT FIGURE POSSIBLE

The largest single quotient figure you can use at any time is 9. Study the example.

Divide 203 by 24.

To find 24's in 203, *divide*. Think, "2's in 2 are 1."
Multiply. $1 \times 24 = 24$. *Compare*. Why is the quotient figure 1 incorrect?
Now to find 24's in 203, *divide* again. Think, "2's in 20 are 10."
But you cannot use 10 as a quotient figure because it is more than 9.
Try 9 as the quotient figure.
Why is 9 too large this time?
Try 8 as the quotient figure.
Why is 8 correct?

Incorrect
1
24)203
24

Too large
9
24)203
216

Correct
8
24)203
192
11

Divide. Check each answer.

1. $34\overline{)306}$ $13\overline{)119}$ $45\overline{)402}$ $14\overline{)108}$ $23\overline{)210}$

2. $15\overline{)126}$ $74\overline{)713}$ $12\overline{)114}$ $63\overline{)625}$ $14\overline{)112}$

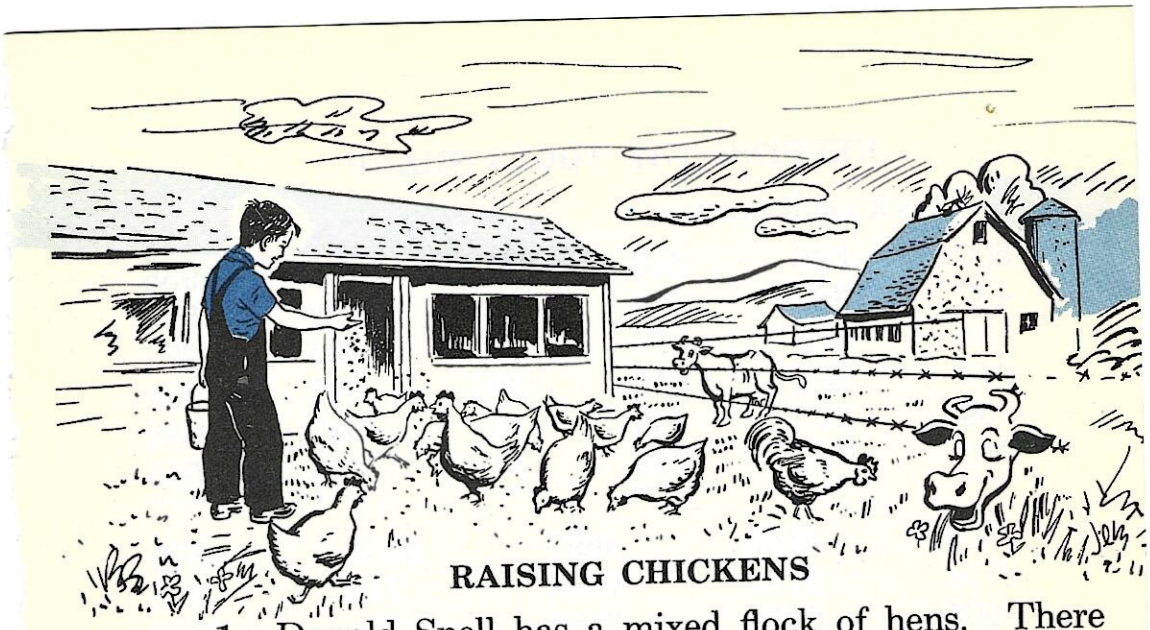
3. $82\overline{)807}$ $52\overline{)516}$ $13\overline{)117}$ $24\overline{)210}$ $35\overline{)312}$

4. $25\overline{)2250}$ $34\overline{)3372}$ $12\overline{)1073}$ $65\overline{)6468}$

5. $13\overline{)1027}$ $94\overline{)9365}$ $15\overline{)1342}$ $33\overline{)3284}$

6. $24\overline{)2367}$ $14\overline{)1375}$ $54\overline{)5379}$ $23\overline{)2056}$

7. At the Girl Guides' camp there were 34 girls, each thirteen years old. If the total weight of the girls was 3026 lb., what was the average weight of the thirteen-year-old girls?



RAISING CHICKENS

1. Donald Snell has a mixed flock of hens. There are 84 Leghorns, 62 Rhode Island Reds, and 78 Plymouth Rocks. How many hens are in the flock?

2. This spring he bought 85 chicks at $ .15 apiece. How much did he pay for the chicks?

3. On Monday he gathered 112 eggs; on Tuesday, 126 eggs; on Wednesday, 109 eggs; and on Thursday, 117 eggs. What was the average number of eggs he gathered each day?

4. He sold 3 dozen eggs to a tourist at $ .59 a dozen. How much change did he give the tourist from a $2.00 bill?

5. A neighbour of the Snells bought 312 chicks, but $\frac{1}{8}$ of them died. How many of these chicks died?

6. Donald Snell said that last year his hens laid an average of 183 eggs each. How many eggs did 97 of Farmer Snell's hens lay?

7. He also said that the average cost of feeding each bird for the year was $2.16. What was the cost of feeding 65 of them?

8. If he made a profit of $1.74 on each chicken he raised, what was his profit on 86 chickens?

KEEPING THE TOOLS SHARP

Add. Check each answer.

1.

507	698	845	991	749	956
487	383	673	478	582	507
756	266	907	723	634	792
632	956	849	696	890	408
809	377	508	283	947	982
910	753	982	541	460	525

2.

5809	8586	4697	5503	4835
8724	8733	6534	719	398
7605	5058	7309	4704	5046
5430	3971	3790	320	2770
7904	7568	9464	5408	534
5310	6323	8207	722	5463

Subtract. Check each answer.

3.

1778	1419	1345	1850	1700
869	786	477	995	764

4.

9000	7000	4252	9545	7107
4937	6483	3378	8998	2009

5.

51929	12085	36140	40001
37269	2387	9437	6277

6.

92526	28524	58663	24000
40686	19269	58477	21148

7.

89300	54203	74851	70206
80302	47744	35982	20208

8.

12731	61745	34108	51024
7742	12978	28009	34858

KEEPING THE TOOLS SHARP

Multiply. Check each answer.

1.	415 × 5	360 × 7	813 × 6	671 × 9	593 × 8	798 × 4
2.	2457 × 6	4267 × 8	7849 × 7	4983 × 9	1695 × 6	
3.	503 × 3	607 × 5	5601 × 4	2050 × 7	8007 × 8	
4.	63 × 40	52 × 90	46 × 27	78 × 36	95 × 81	59 × 48	86 × 69
5.	526 × 76	470 × 38	264 × 23	378 × 98	907 × 74	859 × 86
6.	247 × 400	349 × 360	675 × 527	816 × 248	952 × 604	968 × 709
7.	\$2.39 × 2	\$4.67 × 6	\$3.98 × 5	\$7.32 × 8	\$4.57 × 9	
8.	\$ .46 × 26	\$ .94 × 53	\$ .85 × 71	\$2.53 × 49	\$3.94 × 38	
9.	\$1.85 × 3 00	\$3.49 × 2 70	\$2.37 × 1 69	\$5.86 × 4 65	\$7.91 × 7 02	

Divide. Check each answer.

10.	$62\overline{)2666}$	$45\overline{)3306}$	$19\overline{)1197}$	$54\overline{)3305}$
11.	$28\overline{)1612}$	$67\overline{)5494}$	$83\overline{)4743}$	$37\overline{)2092}$
12.	$23\overline{)2277}$	$73\overline{)5028}$	$26\overline{)1456}$	$49\overline{)2761}$

DIVISION WITH CARRYING—3-FIGURE QUOTIENTS

Mr. Denny owns a large store and employs 42 workers. Last month he paid out \$5712 in salaries. What was the average salary paid?

To find the average salary paid we divide 5712 by 42.

The *first partial dividend* is 57. Find 42's in 57.

Divide, Multiply, Compare, Subtract.

Bring down. REMEMBER:

The *second partial dividend* is 151. Find 42's in 151.

Divide, Multiply, Compare, Subtract.

Bring down, REMEMBER:

The third partial dividend is 252. Find 42's in 252.

Divide, Multiply, Compare, Subtract. There is no remainder.

So the average salary paid was \$136.

REMEMBER *when a figure is brought down from the dividend a figure must be placed above it in the quotient.*

```
  136
42)5712
  42
  151
  126
   252
   252
```

Check:

```
  136
   42
  272
 544
5712
```

Divide. Check each answer.

1.	$21\overline{)5113}$	$53\overline{)9116}$	$24\overline{)8459}$	$73\overline{)9219}$
2.	$36\overline{)5148}$	$25\overline{)9613}$	$49\overline{)6635}$	$28\overline{)9612}$
3.	$72\overline{)44600}$	$32\overline{)10080}$	$68\overline{)11039}$	$59\overline{)20427}$
4.	$47\overline{)11408}$	$96\overline{)24722}$	$47\overline{)10134}$	$87\overline{)37983}$
5.	$17\overline{)12631}$	$34\overline{)31688}$	$19\overline{)11837}$	$55\overline{)52601}$

6. An air-liner travelled a distance of 4784 miles in 26 hours. What was the average number of miles it travelled each hour?

DIVISION—ZERO AT THE END OF THE QUOTIENT

In a factory which makes breakfast food, there are 3852 packages to be shipped. If they are packed in cartons with 24 packages in a carton, hwo many cartons will be needed?

```
   160R12
24)3852
   24
   145
   144
    12
```

To find how many cartons will be needed we *divide* 3852 by 24.
The first partial dividend is 38. *Divide, Multiply, Compare, Subtract, Compare, Bring down.* REMEMBER:
The second partial dividend is 145. Divide, Multiply, Compare, Subtract, Compare, Bring down, REMEMBER:
The third partial dividend is 12. Divide. Think, "24's in 12 are 0." Write the zero over the 2.
So 160 cartons will be needed and there will be 12 packages left over.

Tell how this is done

```
   20
36)720
   72
    0
```

You will not miss putting a zero at the end of the quotient if you REMEMBER *that when a figure is brought down from the dividend a figure must be placed above it in the quotient.*

Divide. Check each answer.

1.	$43\overline{)865}$	$21\overline{)630}$	$18\overline{)731}$	$37\overline{)740}$	$25\overline{)760}$
2.	$64\overline{)1925}$	$52\overline{)3120}$	$95\overline{)4750}$	$87\overline{)6114}$	
3.	$29\overline{)4941}$	$62\overline{)8060}$	$77\overline{)13120}$	$46\overline{)10590}$	
4.	$16\overline{)5760}$	$84\overline{)15985}$	$26\overline{)9628}$	$41\overline{)22140}$	
5.	$93\overline{)78195}$	$38\overline{)12920}$	$56\overline{)25762}$	$79\overline{)43515}$	

6. Mr. George, the grocer, said his total sales last month amounted to $4750. If his store was open 25 days during the month, how much were his average sales each day?

DIVISION—ZERO IN THE MIDST OF THE QUOTIENT

An air-plane made a trip of 5562 miles in 27 hours of flying. What was the average speed of the air-plane each hour?

To find the average speed of the air-plane each hour we divide 5562 by 27.

The first partial dividend is 55.

Divide, Multiply, Compare, Subtract, Compare.

Bring down the 6, REMEMBER:

The second partial dividend is 16. *Divide.* Think, "*27's in 16 are 0.*" Write the 0 over the 6.

Bring down the 2.

The new partial dividend is 162. *Divide*, etc.

So the average speed was 206 miles an hour.

You will not miss putting a zero in the midst of the quotient if you REMEMBER *that when a figure is brought down from the dividend a figure must be placed above it in the quotient.*

```
  206
27)5562
  54
  ---
  162
  162
  ---
```

Check:

```
  206
   27
 ----
 1442
  412
 ----
 5562
```

Divide. Check each answer.

1.	$23\overline{)2392}$	$45\overline{)9135}$	$31\overline{)12555}$	$52\overline{)15964}$
2.	$73\overline{)7965}$	$28\overline{)8568}$	$36\overline{)18272}$	$67\overline{)33778}$
3.	$81\overline{)49021}$	$59\overline{)24131}$	$13\overline{)2711}$	$18\overline{)1926}$
4.	$85\overline{)68117}$	$42\overline{)12948}$	$16\overline{)14432}$	$78\overline{)31689}$
5.	$93\overline{)46779}$	$68\overline{)7308}$	$34\overline{)20706}$	$19\overline{)15276}$

6. How many cases will be needed to pack 9888 cans of tomatoes if each case holds 48 cans?

7. Mr. Logan drove his car 7638 mi. last year. If he averaged 19 mi. to a gallon of gasoline, how many gallons of gasoline did he use last year?

8. At a sale of ladies coats, Mr. Fraser took in $2650. If the coats sold for $25 each, how many coats did he sell?

DIVIDING DOLLARS AND CENTS

Tony is a newsboy who puts some of the money he earns in the bank each week. Last year he saved \$85.80. There are 52 weeks in a year. What was the average amount Tony put in the bank each week?

To find the average amount he put in the bank each week we *divide* \$85.80 by 52. To divide dollars and cents divide in the same way you divide other numbers.

Put a decimal point in the quotient exactly over the decimal point in the dividend. Put a dollar sign before the quotient.

So Tony put an average of \$1.65 in the bank each week.

```
      $ 1.65
52)$85.80
     52
     338
     312
      260
      260

Check:
 $1.65
   52
  330
 825
$85.80
```

Tell how this is done. →

```
      $ .36
24)$8.64
    72
    144
    144

Check:
 $ .36
   24
  144
   72
$8.64
```

Divide. Check each answer.

1.	23)\$56.58	72)307.44	36)\$185.04	28)\$49.00
2.	15)\$102.45	64)\$86.40	19)\$67.64	43)\$413.66
3.	30)\$8.40	50)\$23.50	42)\$5.88	12)\$7.44
4.	31)\$14.57	27)\$22.95	83)\$51.46	44)\$15.40
5.	73)\$40.88	21)\$11.13	52)\$14.04	33)\$14.85
6.	84)\$42.84	16)\$25.60	25)\$26.75	63)\$15.12
7.	91)\$33.67	53)\$328.60	24)\$17.28	73)\$296.38

PROBLEMS IN DIVIDING DOLLARS AND CENTS

1. The principal of Central School bought 36 new books for the library. If he paid $48.24 for them what was the average price of the books?

2. Mrs. Quirks' milk bill for the month of April was $4.80. If she bought 30 quarts of milk during the month how much was milk a quart?

3. Madge sold 50 tickets for a chicken dinner and took in $32.50. How much did a ticket for the dinner cost?

4. Farmer Gordon sold 75 bushels of potatoes to a grocer and received $123.75. How much a bushel did he get for his potatoes?

5. Fred's brother worked 32 hours for Mr. Smith and was paid $20.80. How much an hour did he get?

6. The principal of our school bought 75 small flags to be used in the Empire Day parade. If they cost $11.25, how much did each flag cost?

7. The Girl Guides used 23 dozen oranges at their camp. If the oranges cost $9.66, how much a dozen did the oranges cost?

8. The Boy Scouts of Grave V sold apples on Boy Scout Apple Day. If the 28 Scouts of Grade V got $88.20 for the apples they sold, what was the average for each boy?

9. Miss Nelson's class gave $4.80 to the Red Cross. What was the average amount given by the pupils if there were 32 pupils in the class?

10. Sally sold 35 tickets for the school concert and turned in $8.75 to the teacher. How much did Sally get for each ticket?

DIAGNOSTIC TEST IN DIVISION BY A TWO-FIGURE DIVISOR

The work below will test you on the kinds of division by a two-figure divisor you should know. If you make mistakes on any kind go back and do again the exercises on the page whose number is shown on the right.

				Page
	DIVISOR ENDING IN 1, 2, 3, 4, OR 5			
1.	$42\overline{)906}$	$64\overline{)1674}$	$75\overline{)2625}$	77 and 80
	BE SURE THE QUOTIENT FIGURE IS CORRECT			
2.	$34\overline{)627}$	$85\overline{)2431}$	$53\overline{)3117}$	84
	DIVISOR ENDING IN 6, 7, 8, OR 9			
3.	$29\overline{)1315}$	$68\overline{)5046}$	$46\overline{)3017}$	87
	BE SURE THE QUOTIENT FIGURE IS CORRECT			
4.	$46\overline{)3864}$	$67\overline{)5494}$	$38\overline{)3118}$	88
	DIVISION BY THE "TEENS"			
5.	$14\overline{)675}$	$16\overline{)993}$	$18\overline{)1478}$	91
	9 IS LARGEST QUOTIENT FIGURE POSSIBLE			
6.	$53\overline{)5289}$	$24\overline{)2156}$	$35\overline{)3115}$	92
	THREE-FIGURE QUOTIENTS			
7.	$63\overline{)15446}$	$47\overline{)7661}$	$86\overline{)27284}$	96
	ZERO AT THE END OF THE QUOTIENT			
8.	$27\overline{)1620}$	$33\overline{)7934}$	$48\overline{)22080}$	97
	ZERO IN THE MIDST OF THE QUOTIENT			
9.	$62\overline{)12834}$	$75\overline{)7749}$	$37\overline{)22348}$	98
	DIVIDING DOLLARS AND CENTS			
10.	$44\overline{)\$125.84}$	$18\overline{)\$112.14}$	$86\overline{)\$23.22}$	99

A SKATING PARTY

The pupils of Lakeview School had a skating party and after it they had a lunch in the school building.

1. There were 87 pupils at the skating party. If 39 of them were girls, how many boys were at the party?

2. To pay expenses each of the pupils paid 15¢ for a ticket to the party. How much was paid for the tickets?

3. Bill and Tony are fast skaters. They had a race around the rink. Bill took 1 minute and 6 seconds and Tony took 57 seconds. How many seconds more did Bill take than Tony?

4. The principal ordered 96 bottles of pop for the lunch. If he paid 7¢ a bottle, how much did the pop cost?

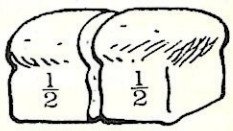
5. The teachers helped to make sandwiches for the lunch. They made 168 sandwiches. If they made 12 sandwiches from each loaf, how many loaves were used?

6. Besides the pop and bread the teachers had to buy meat, cheese, butter, and coffee for the lunch. If the total cost for the lunch was $15.65 and they took in $13.05 from the tickets, how much more did the lunch cost than they took in?

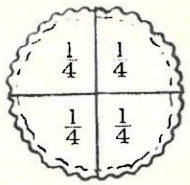
7. If the 4 teachers paid the difference between what the lunch cost and what they took in from the tickets, how much did each teacher have to pay if each paid the same amount? (Use your answer from question 6).

THE MEANING OF A FRACTION

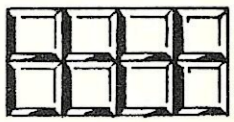
The loaf of bread on the right is divided or cut into *two equal parts.* Each of the equal parts is *one-half* of the loaf. One-half is written in figures as $\frac{1}{2}$. Two-halves of the loaf is the same as the whole loaf. Two-halves is written, $\frac{2}{2}$. So $\frac{2}{2}=1$.



Here is a pie divided into *four equal parts.* Each of the equal parts is *one-fourth* of the pie. One-fourth is written, $\frac{1}{4}$. Point out two-fourths of the pie. Two-fourths is written, $\frac{2}{4}$. Point out and write three-fourths of the pie. How many fourths are the same as the whole pie? $\frac{4}{4}=1$.



There are 8 parts in the chocolate bar on the right. All the parts are the *same size.* Each part is *one-eighth* of the chocolate bar. One-eighth is written, $\frac{1}{8}$. If you ate three of the equal parts you would have eaten three-eighths of the bar. Three-eighths is written $\frac{3}{8}$. Point out and write five-eighths of the chocolate bar. How many eighths are there in the whole bar? $\frac{8}{8}=1$.



Take a sheet of paper and fold it from the bottom to the top. Fold it again from the bottom to the top. Tear it along the creases.

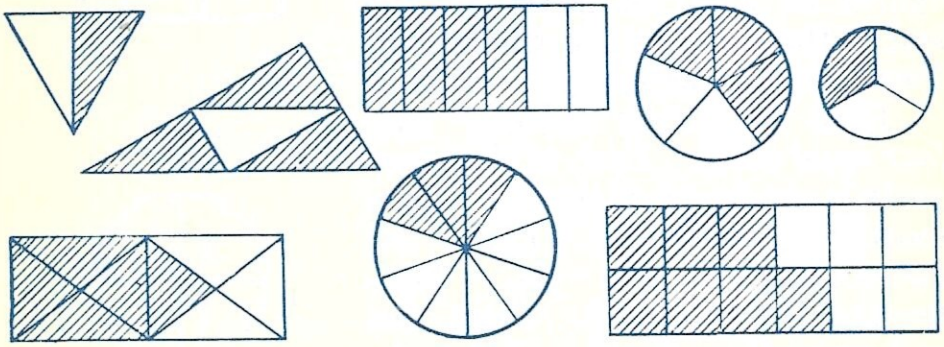
1. Into how many parts is the paper divided?

2. What do you notice about the size of the parts? What is the name of each part?

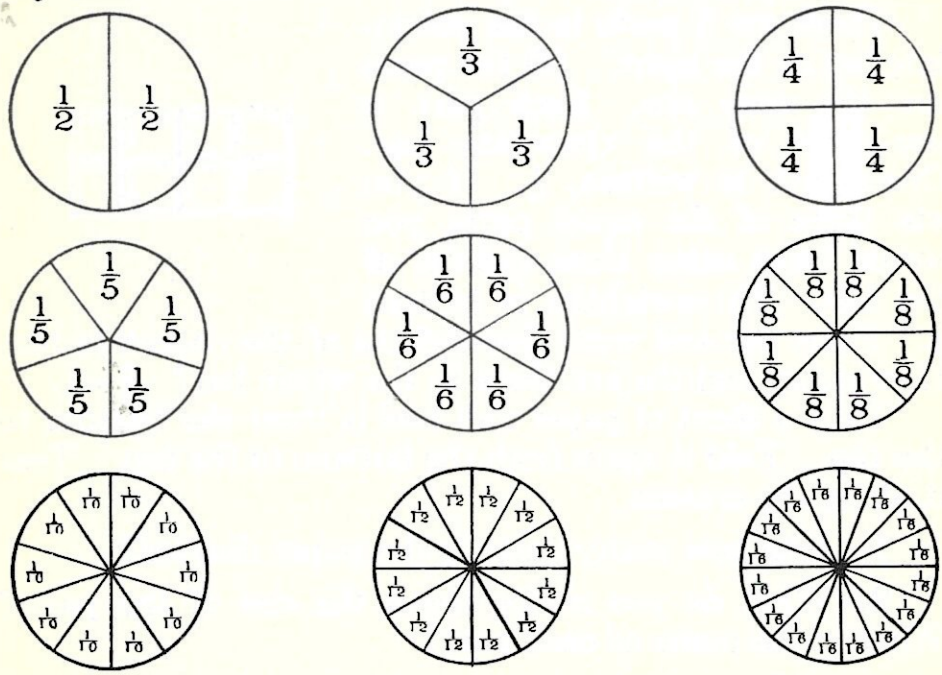
3. *A fraction is one or more of the equal parts into which a whole is divided.* $\frac{1}{2}$, $\frac{3}{4}$, and $\frac{5}{8}$ are fractions.

THE MEANING OF A FRACTION

1. The wholes below are divided into equal parts. Write the fraction which shows what part of each whole is shaded. Also write the fraction which shows the part of each whole which is not shaded.



2. Tell into how many parts each circle is divided and say and write the name of each equal part.



COMPARING FRACTIONS*

All the circles at the foot of page 104 are the same size. Each is divided into a number of equal parts. Use these circles to answer the questions below.*

1. Which is the larger: $\frac{1}{2}$ or $\frac{1}{3}$? $\frac{1}{2}$ or $\frac{2}{3}$?

2. Which is the larger: $\frac{1}{3}$ or $\frac{1}{4}$? $\frac{1}{3}$ or $\frac{2}{4}$? $\frac{2}{3}$ or $\frac{3}{4}$?

3. Which is the larger: $\frac{1}{3}$ or $\frac{1}{5}$? $\frac{1}{4}$ or $\frac{1}{5}$? $\frac{2}{4}$ or $\frac{3}{5}$? $\frac{2}{3}$ or $\frac{4}{5}$?

4. Which is the smaller: $\frac{1}{5}$ or $\frac{1}{6}$? $\frac{2}{5}$ or $\frac{1}{3}$?

5. Which is the larger: $\frac{1}{6}$ or $\frac{1}{8}$? $\frac{3}{6}$ or $\frac{5}{8}$? $\frac{7}{8}$ or $\frac{5}{6}$?

6. Which is the larger: $\frac{1}{10}$ or $\frac{1}{8}$? $\frac{2}{6}$ or $\frac{3}{10}$? $\frac{3}{4}$ or $\frac{9}{10}$?

7. Which is the larger: $\frac{1}{12}$ or $\frac{1}{10}$? $\frac{5}{12}$ or $\frac{4}{10}$? $\frac{9}{10}$ or $\frac{7}{12}$?

8. Which is the larger: $\frac{1}{10}$ or $\frac{1}{12}$? $\frac{3}{8}$ or $\frac{4}{16}$? $\frac{13}{16}$ or $\frac{11}{12}$?

9. Which is the smaller: $\frac{1}{4}$ of an orange or $\frac{1}{3}$ of the orange?

10. Which is the larger: $\frac{1}{6}$ of an apple or $\frac{1}{8}$ of the apple?

11. Mary's hair-ribbon is $\frac{1}{2}$ of a yard long and Ellen's is $\frac{1}{3}$ of a yard long. Which girl has the longer hair-ribbon?

12. Can you give a reason why $\frac{1}{12}$ of anything is larger than $\frac{1}{16}$ of the same thing?

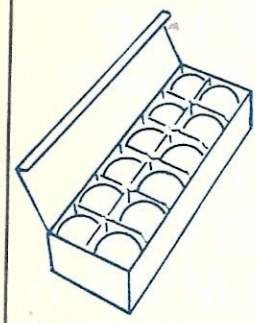
13. How many tenths are there in one whole?

14. How many sixteenths in one whole?

*Hint to Teacher. Have cardboard circles about 1 foot in diameter divided into the number of parts shown on page 104 with the name of each indicated. Separate the parts. Have pupils answer the questions above by superimposing the parts.

THE MEANING OF A FRACTION

On page 103 we divided a whole which was a single thing or a *unit*, into equal parts. We can also divide a *group* into equal parts and write one or more of the equal parts as a fraction.

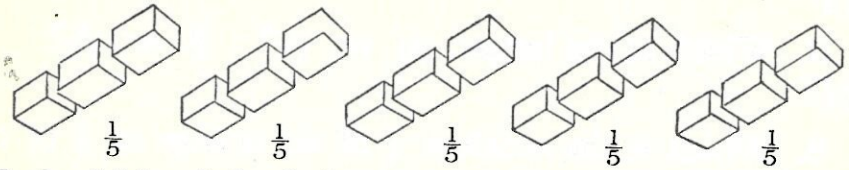


There are 12 eggs in the carton on the left. The 12 eggs are divided into two equal parts. There are 6 eggs (the same number) in each part. Each part is $\frac{1}{2}$ of the group of 12 eggs.

To find $\frac{1}{2}$ of the number in a group divide the number by 2.

$\frac{1}{2}$ of 12 is $12 \div 2 = 6$.

Mrs. Stevens made 15 pieces of fudge and divided them equally among her five children as shown below.



Each child got $\frac{1}{5}$ of the 15 pieces of fudge. How many fifths did 3 children get? How many fifths did 4 get?

Each child got 3 pieces of fudge. So $\frac{1}{5}$ of 15 is 3.

To find $\frac{1}{5}$ of the number in a group divide the number by 5.

$\frac{1}{5}$ of 15 is $15 \div 5 = 3$.

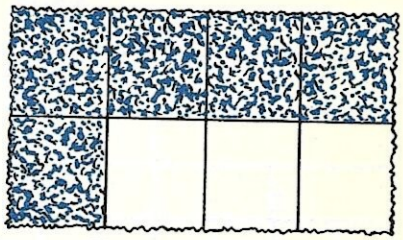
Find:

1. $\frac{1}{2}$ of 24	$\frac{1}{4}$ of 20	$\frac{1}{5}$ of 30
2. $\frac{1}{6}$ of 42	$\frac{1}{8}$ of 32	$\frac{1}{7}$ of 56
3. $\frac{1}{3}$ of 129	$\frac{1}{9}$ of 72	$\frac{1}{10}$ of 80
4. $\frac{1}{12}$ of 132	$\frac{1}{16}$ of 96	$\frac{1}{20}$ of 240

A fraction is one or more of the equal parts into which a single whole or a group is divided.

A single whole is called a unit and a group is called a unit if we think of the group as one whole.

THE TERMS OF A FRACTION



Mrs. Cox is hooking a mat which is divided into 8 *equal* parts. She has already hooked 5 of the equal parts; so she has hooked $\frac{5}{8}$ of the mat. The fraction, $\frac{5}{8}$, tells two things:

(1) The figure 8, below the line, tells us that the mat was divided into 8 equal parts; and, (2) The figure 5, above the line, tells us that 5 of the equal parts are taken or are talked about.

The figure below the line of a fraction is called the *denominator* of the fraction. *The denominator tells into how many equal parts a whole is divided.* The whole may be a single thing or a group.

The denominator also gives a fraction its name. The name of the fraction here, $\frac{5}{8}$, is *eighths*.

The figure above the line of a fraction is called the *numerator* of the fraction. *The numerator tells how many of the equal parts are taken or are talked about.*

The numerator and denominator of a fraction are called the *terms* of the fraction. The terms of the fraction, $\frac{5}{8}$, are 5 and 8.

$\frac{5}{8}$	← **numerator**	← **the number of parts taken**
	← **denominator**	← **the number of equal parts**

1. Give the numerator and the denominator of each of these fractions:

$\frac{2}{3}$ $\frac{4}{5}$ $\frac{7}{10}$ $\frac{3}{8}$ $\frac{5}{6}$ $\frac{1}{4}$ $\frac{7}{12}$ $\frac{11}{16}$

2. Tell what each of the above fractions means.

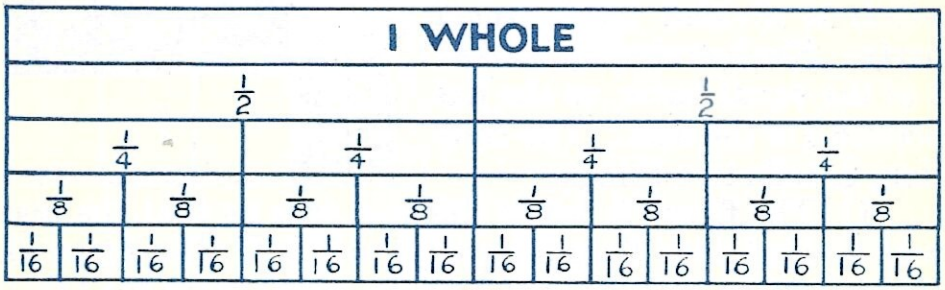
3. Tell what $\frac{3}{4}$ of an apple means.

4. What do you mean by $\frac{7}{12}$ of a foot?

5. John said he ate $\frac{2}{5}$ of the candy. What did John mean?

6. Fred ran $\frac{5}{16}$ of a mile. What does that mean?

COMPARING HALVES, FOURTHS, EIGHTHS, AND SIXTEENTHS



In the drawing above *one whole* is divided into *halves, fourths, eighths,* and *sixteenths.*

Notice that 1 whole $=\frac{2}{2}$, so $1=\frac{2}{2}$ or $\frac{2}{2}=1$.

1. How many fourths in 1? How many eighths in 1? How many sixteenths in 1?

2. Draw your finger along $\frac{1}{2}$. Below this draw your finger along the fourths to find how many fourths there are in $\frac{1}{2}$. You see that $\frac{1}{2}=\frac{2}{4}$ or $\frac{2}{4}=\frac{1}{2}$.

Now answer these questions below from the drawing and write the answers as given in Exercise 2.

3. $\frac{1}{2}$=how many eighths? **4.** $\frac{1}{2}$=how many sixteenths?

5. $\frac{1}{4}$=how many eighths? **6.** $\frac{1}{4}$=how many sixteenths?

7. $\frac{3}{4}$=how many eighths? **8.** $\frac{3}{4}$=how many sixteenths?

9. $\frac{1}{8}$=how many sixteenths? **10.** $\frac{2}{8}$=how many sixteenths?

Use the drawing to find the number to fill in each blank in these:

11. $\frac{1}{2}=\frac{}{8}$ **12.** $\frac{3}{4}=\frac{}{16}$ **13.** $\frac{5}{8}=\frac{}{16}$ **14.** $\frac{7}{8}=\frac{}{16}$

15. Which would you rather have: $\frac{3}{8}$ of a chocolate bar or $\frac{6}{16}$ of the same chocolate bar?

16. Using the drawing show that $\frac{1}{2}=\frac{2}{4}=\frac{4}{8}=\frac{8}{16}$.

You should know these by heart: Memorize them.

$\frac{1}{2}=\frac{2}{4}$	$\frac{1}{2}=\frac{4}{8}$	$\frac{1}{4}=\frac{2}{8}$	$\frac{3}{4}=\frac{6}{8}$

FRACTIONAL PARTS OF AN INCH

The measure above is divided into inches. Each inch is divided into halves, fourths, eighths, and sixteenths.

1. Which lines on the foot measure mark off the whole inches? the $\frac{1}{2}$ inches? the $\frac{1}{4}$ inches. the $\frac{1}{8}$ inches?

2. Each inch above is divided into 16 equal parts. What is the name of each small part?

Use your own foot measure for these questions.

3. $\frac{1}{2}$ in. = how many fourths of an inch?

4. $\frac{1}{4}$ in. = how many eighths of an inch?

5. Measure the length of this line:

_____

You will find it is 2 whole inches long and $\frac{3}{4}$ of another inch. We say the line is $2\frac{3}{4}$ in. long. This is read, "two and three-fourths inches".

6. _____ Measure this line.

If you are right you will find it is $\frac{11}{16}$ in. long. This is read, "eleven-sixteenths of an inch".

7. How long is each of these lines?

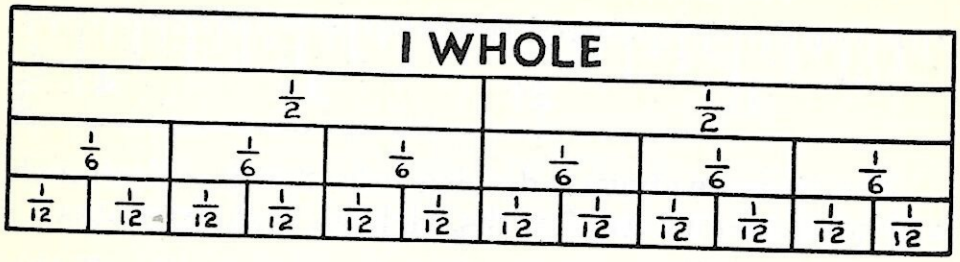
_____ _____

_____ _____ _____

A number like $2\frac{3}{4}$ is called a *mixed number* because it is made up of a whole number (2) and a fraction ($\frac{3}{4}$). $2\frac{3}{4}$ inches means *2 whole inches* and $\frac{3}{4}$ of *another inch.*

8. Read these mixed numbers and tell what each means: $5\frac{3}{8}$ in.; $10\frac{1}{2}$ mi.; $4\frac{1}{4}$ gal.; $3\frac{3}{4}$ hr.; $6\frac{3}{16}$ lb.

COMPARING HALVES, SIXTHS, AND TWELFTHS



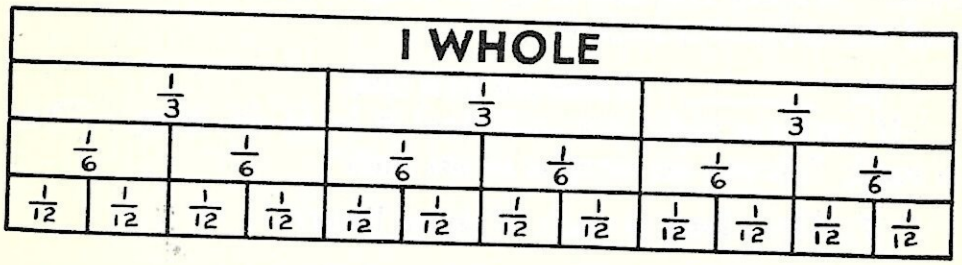
In the drawing above 1 whole is divided into halves, sixths, and twelfths.

1. How many sixths are 1 whole? So $\frac{6}{6}=1$.
2. How many twelfths are 1 whole? So $\frac{12}{12}=1$.
3. How many sixths are there in one-half?
   Notice that, $\frac{3}{6}=\frac{1}{2}$ or $\frac{1}{2}=\frac{3}{6}$.

Use the drawing above to fill in the blanks below.

4. $\frac{1}{2}=\frac{}{12}$ $\quad\frac{1}{6}=\frac{}{12}$ $\quad\frac{2}{6}=\frac{}{12}$
5. $\frac{3}{6}=\frac{}{12}$ $\quad\frac{4}{6}=\frac{}{12}$ $\quad\frac{5}{6}=\frac{}{12}$

COMPARING THIRDS, SIXTHS, AND TWELFTHS



In the drawing above 1 whole is divided into thirds, sixths, and twelfths.

1. How many thirds are in 1? So $\frac{3}{3}=1$.

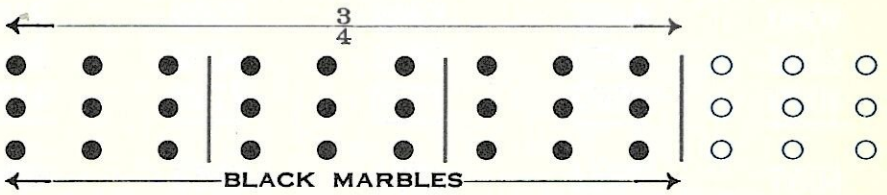
Use the drawing above to fill in the blanks below:

2. $\frac{1}{3}=\frac{}{6}$ $\quad\frac{2}{3}=\frac{}{6}$ $\quad\frac{3}{3}=\frac{}{6}$
3. $\frac{1}{3}=\frac{}{12}$ $\quad\frac{2}{3}=\frac{}{12}$ $\quad\frac{3}{3}=\frac{}{12}$

FINDING FRACTIONAL PARTS OF NUMBERS

Sam had 36 marbles. $\frac{3}{4}$ of Sam's marbles are black. How many black marbles has he?

To find how many black marbles Sam has we must find $\frac{3}{4}$ of 36.



Above you see the 36 marbles Sam has. The 36 marbles have been divided into 4 equal parts so each part is $\frac{1}{4}$ of 36. You know that you can find $\frac{1}{4}$ of 36 by dividing 36 by 4, so $\frac{1}{4}$ of 36 is 9. Count the marbles in $\frac{1}{4}$ above to see that this is correct.

```
  9
4)36

  9
 ×3
 27
```

Count how many black marbles there are. There are 27. So $\frac{3}{4}$ of $36 = 27$.

Here is a short way to find $\frac{3}{4}$ of 36.

Find $\frac{1}{4}$ of 36. Divide 36 by 4 which is 9.

Since $\frac{1}{4}$ of 36 is 9, $\frac{3}{4}$ of 36 is 3 times 9.

Multiply. $3 \times 9 = 27$.

So Sam had 27 black marbles.

Rule: To find a fractional part of a number do 2 things: (1) Divide the number by the denominator of the fraction, and (2) multiply the answer by the numerator of the fraction.

Find the answers:

1. $\frac{2}{3}$ of 27 $\quad \frac{4}{5}$ of 35 $\quad \frac{3}{8}$ of 24 $\quad \frac{5}{6}$ of 60
2. $\frac{3}{4}$ of 48 $\quad \frac{7}{10}$ of 90 $\quad \frac{2}{5}$ of 65 $\quad \frac{7}{8}$ of 72
3. $\frac{5}{8}$ of \$1.68 $\quad \frac{5}{6}$ of \$3.60 $\quad \frac{3}{10}$ of \$ .50 $\quad \frac{5}{16}$ of \$1.60
4. There are 36 inches in a yard. How many inches are there in $\frac{2}{3}$ of a yard? $\frac{3}{4}$ of a yard? $\frac{5}{6}$ of a yard? $\frac{7}{9}$ of a yard?

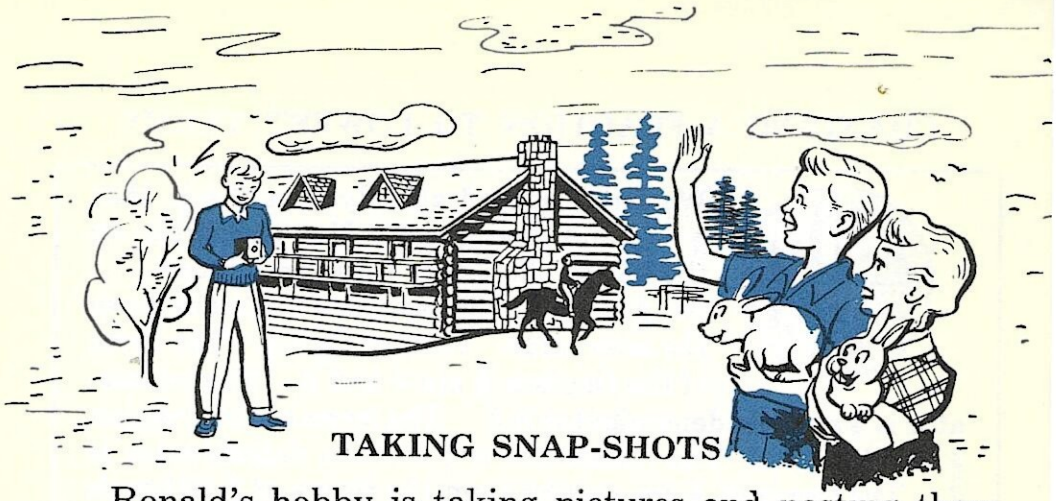
KEEPING THE TOOLS SHARP

Add. Check each answer.

1.	6064	8245	7803	8077	1932
	6249	5693	6714	7994	4737
	5105	7326	4935	9630	5579
	9080	5485	5420	5269	3466
	5252	4677	7602	4032	9983
	4070	9595	2710	7126	4528
2.	5057	7444	4804	8552	6256
	9326	5753	7788	2683	8942
	8464	8376	3562	4926	6458
	3730	6295	6607	4683	4725
	5067	5363	7070	2578	9248
	8856	7974	2388	7684	6934

Subtract Check each answer.

3.	1365	1326	1642	1720	1400
	747	380	985	954	793
4.	9000	7000	6461	4507	5106
	5748	425	1789	3938	1059
5.	69593	52164	12458	17007	
	48675	28397	6569	8421	
6.	20001	15761	68350	98000	
	1653	15097	50584	72265	
7.	82530	26257	77035	20501	
	34776	25479	69769	10804	
8.	40522	74014	21246	18460	
	33569	54185	17297	9689	



TAKING SNAP-SHOTS

Ronald's hobby is taking pictures and pasting them in his snap-shot album. When he gets older he and his friends will get a lot of pleasure and fun from his snap-shot album.

1. Ronald needed a new camera. At the store he saw a box camera at \$6.75 and a folding camera at \$22.00. What was the difference in the prices of the cameras?

2. Ronald paid \$6.75 for the box camera and he bought 2 films which cost 37¢ each. How much did he pay for the camera and the films?

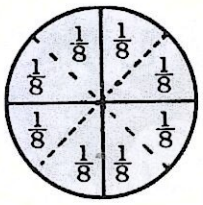
3. When Ronald went camping, he bought 4 films at 37¢ each. How much change did he get if he paid for them with a \$5 bill?

4. Each film that Ronald buys will take 8 snap-shots. Last evening he counted the number of snap-shots in his album and found there were 136. How many films were used in taking these snap-shots?

5. Last week he paid 37¢ for a film which took 8 snap-shots. He paid 47¢ for having the film developed and getting one print of each snap-shot. If one snap-shot was spoiled, how much did each print cost?

6. Ronald is saving money to buy a better camera. He wants a folding one which will cost \$26.35. If he has saved \$9.80 already, how much more will he have to save to buy the folding camera?

CHANGING A FRACTION TO LOWEST TERMS



We have learned already that $\frac{2}{4}=\frac{1}{2}$, that $\frac{4}{8}=\frac{1}{2}$, and that $\frac{4}{8}=\frac{2}{4}$. Use the circle on the left to show that these are correct.

So, $\frac{4}{8}=\frac{2}{4}=\frac{1}{2}$. These three fractions have the *same value*. Consider $\frac{4}{8}=\frac{1}{2}$. The *terms* of the fraction $\frac{4}{8}$ are 4 and 8. The numerator is 4 and the denominator is 8. The *terms* of the fraction $\frac{1}{2}$ are 1 and 2. The numerator is 1 and the denominator is 2. The terms of $\frac{1}{2}$ are *smaller* than the terms of $\frac{4}{8}$ although the fractions $\frac{4}{8}$ and $\frac{1}{2}$ have the *same value.*

Look at $\frac{4}{8}=\frac{1}{2}$ again. We can see that if we divide both the numerator and the denominator of $\frac{4}{8}$ by 4 we get $\frac{1}{2}$ which has the same value as $\frac{4}{8}$.

$\frac{4}{8}=\frac{4\div2}{8\div2}=\frac{2}{4}$ In the same way, $\frac{2}{4}=\frac{2\div2}{4\div2}=\frac{1}{2}$

Remember this rule: If we divide both the numerator and the denominator of a fraction by the same number the value of the fraction does not change; only the terms of the fraction change.

A fraction may be changed to *lower terms*, such as $\frac{4}{8}=\frac{2}{4}$ or to *lowest terms*, like $\frac{4}{8}=\frac{1}{2}$. *A fraction is in its lowest terms when both the numerator and the denominator cannot be divided evenly by any number except 1.*

How to Change a Fraction to Lowest Terms

Change $\frac{8}{12}$ to lowest terms.

Find the largest number that will divide evenly into both the numerator and the denominator, and divide both the numerator and the denominator by that number.

4 is the largest number that will divide evenly into both 8 and 12.

Think, $\frac{8}{12}=\frac{8\div4}{12\div4}=\frac{2}{3}$ Write, $\frac{8}{12}=\frac{2}{3}$

When we change a fraction to lowest terms we do not make the value of the fraction smaller. We only use smaller numbers for the numerator and denominator.

CHANGING A FRACTION TO LOWEST TERMS

1. When is a fraction in its lowest terms?

2. Which of these fractions are in their lowest terms?

$\frac{2}{3}$ $\frac{4}{8}$ $\frac{6}{10}$ $\frac{5}{6}$ $\frac{7}{12}$ $\frac{6}{8}$ $\frac{10}{16}$ $\frac{5}{8}$

Change these fractions to lowest terms:

3. $\frac{2}{6}$ $\frac{6}{9}$ $\frac{8}{12}$ $\frac{6}{10}$ $\frac{8}{16}$ $\frac{6}{8}$ $\frac{4}{10}$ $\frac{12}{16}$

4. $\frac{2}{10}$ $\frac{4}{6}$ $\frac{8}{10}$ $\frac{3}{12}$ $\frac{10}{20}$ $\frac{4}{16}$ $\frac{8}{24}$ $\frac{2}{12}$

5. $\frac{3}{9}$ $\frac{14}{16}$ $\frac{12}{20}$ $\frac{8}{32}$ $\frac{10}{12}$ $\frac{18}{24}$ $\frac{16}{20}$ $\frac{18}{32}$

6. Bill wanted to change $\frac{16}{24}$ to its lowest terms. He divided both 16 and 24 by 4 and got $\frac{16}{24}=\frac{4}{6}$. Did Bill change $\frac{16}{24}$ to lowest terms?

7. Bill, however, did not have to do all the work over again. He saw that both 4 and 6 of the fraction, $\frac{4}{6}$, could be divided by 2. So when Bill finished, his work looked like this: $\frac{16}{24}=\frac{4}{6}=\frac{2}{3}$. Did Bill change $\frac{16}{24}$ to lowest terms that way?

Hint: *If you cannot find the largest number that will divide evenly into both the numerator and the denominator of a fraction divide by any number that will divide evenly into both and keep on doing this until the fraction is in its lowest terms.*

Change these fractions to lowest terms the shortest way you can:

8. $\frac{12}{24}$ $\frac{16}{20}$ $\frac{24}{32}$ $\frac{12}{18}$ $\frac{32}{48}$ $\frac{18}{24}$ $\frac{24}{40}$

9. $\frac{6}{8}$ of a mile is the same as how many fourths of a mile?

10. $\frac{2}{4}$ of a dollar is the same as how many halves of a dollar?

11. $\frac{12}{16}$ of a pound is the same as how many fourths of a pound?

12. $\frac{36}{60}$ of an hour is the same as how many fifths of an hour?

CHANGING FRACTIONS TO LOWEST TERMS

Mary went into the pantry to get a can of baking soda for her mother. "Mother," said Mary, "it says on the can that the baking soda in this can weighs 12 ounces."
"That is right, Mary," said her mother. "Can you tell what part of a pound 12 ounces is?"
This is the way Mary found out:
1 pound is 16 ounces, so 12 ounces is $\frac{12}{16}$ of a pound. Then Mary changed $\frac{12}{16}$ to its lowest terms this way: Think, $\frac{12}{16} = \frac{12 \div 4}{16 \div 4} = \frac{3}{4}$
So the can of baking powder contained $\frac{3}{4}$ of a pound.

Change all answers to lowest terms.

1. Mrs. Truman bought a dozen eggs. The next morning the family ate 9 eggs. What part of the dozen did they eat?

2. Bill measured the length of his book and found it was 8 in. long. What part of a foot was that?

3. Mary bought a yard of ribbon. She cut off a 16 inch piece and gave it to her little sister. What part of the yard did Mary give to her sister?

4. Tony is taking piano lessons. Yesterday he practised for 20 min. What part of an hour did he practise?

5. Doctors say we should sleep 8 hr. a day. What fraction of a day would that be?

6. Mrs. French bought a bushel of potatoes. In a short time she found she had used 2 pecks of them. What part of the bushel had she used?

7. The summer vacation is 2 months long. What fraction of a year is that?

8. Mrs. Thompson made a pie and cut it into 8 equal pieces. At dinner 6 of these were eaten. What fraction of the pie was eaten?

ADDING FRACTIONS WHICH HAVE THE SAME NAME

Add.

4 books	2 men	6 inches	8 gallons
3 books	3 men	4 inches	3 gallons
7 books	5 men	10 inches	11 gallons

We can add each of the above because *they have the same name.* However, we cannot add 6 inches / 3 gallons because "inches" and "gallons" have different names.

Only things which have the same name can be added. So with fractions.

Rule: **Only fractions with the same name can be added.**

Mrs. Gordon made a pie. The family ate $\frac{1}{8}$ of the pie at lunch and $\frac{5}{8}$ of the pie at dinner. How much of the pie did they eat?

To find out how much of the pie they ate we *add* $\frac{1}{8}$ and $\frac{5}{8}$.

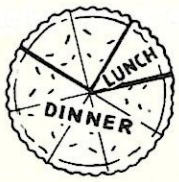
We can add $\frac{1}{8}$ and $\frac{5}{8}$ because they have the same name, *eighths*.

Add the numerators. $1+5=6$.

Write the 6 over the denominator, 8.

Change $\frac{6}{8}$ to lowest terms, $\frac{6}{8}=\frac{3}{4}$

So the family ate $\frac{3}{4}$ of the pie.



1-eighth $\frac{1}{8}$
5-eighths $\frac{5}{8}$
6-eighths $\frac{6}{8}=\frac{3}{4}$

Rule: To add fractions with the same name add the numerators of the fractions and write the sum over the common denominator of the fractions. The answer must always be changed to lowest terms.

Add. All answers must be in lowest terms.

1.

$\frac{1}{4}$	$\frac{2}{5}$	$\frac{2}{6}$	$\frac{1}{8}$	$\frac{3}{10}$	$\frac{5}{12}$	$\frac{7}{16}$	$\frac{4}{9}$
$\frac{1}{4}$	$\frac{2}{5}$	$\frac{1}{6}$	$\frac{4}{8}$	$\frac{3}{10}$	$\frac{4}{12}$	$\frac{5}{16}$	$\frac{2}{9}$

2. $\frac{1}{3}+\frac{1}{3}$ $\qquad$ $\frac{6}{16}+\frac{3}{16}+\frac{5}{16}$ $\qquad$ $\frac{1}{12}+\frac{7}{12}+\frac{3}{12}$

ADDING MIXED NUMBERS

Billy's father is a cook at a hotel. Yesterday he bought two roasts of beef. One roast weighed $6\frac{3}{16}$ lb., and the other weighed $8\frac{5}{16}$ lb. How many pounds of beef did he buy?

To find out how many pounds of beef he bought we *add* $6\frac{3}{16}$ and $8\frac{5}{16}$.

$$\begin{array}{r} 6\frac{3}{16} \\ 8\frac{5}{16} \\ \hline 14\frac{8}{16} = 14\frac{1}{2} \end{array}$$

Write the mixed numbers as shown.

The fractions in the mixed numbers have the same name, sixteenths, so we can add them.

Add the fractions first, $\frac{3}{16} + \frac{5}{16} = \frac{8}{16}$

Write the $\frac{8}{16}$ under the fractions.

Now add the whole numbers, $6 + 8 = 14$

Write the 14 as shown.

Change $\frac{8}{16}$ to lowest terms. $\frac{8}{16} = \frac{1}{2}$

Write the answer as shown.

So Billy's father bought $14\frac{1}{2}$ lb. of beef.

Add down. Check by adding up. Answers must be in lowest terms.

1.	$4\frac{1}{8}$	$6\frac{2}{5}$	$2\frac{1}{4}$	$7\frac{3}{6}$	$13\frac{1}{10}$	$11\frac{7}{12}$
	$2\frac{3}{8}$	$3\frac{2}{5}$	$5\frac{1}{4}$	$1\frac{1}{6}$	$4\frac{7}{10}$	$6\frac{2}{12}$
2.	$8\frac{2}{9}$	$1\frac{9}{16}$	$2\frac{1}{8}$	$16\frac{2}{4}$	$5\frac{1}{6}$	$9\frac{3}{10}$
	$4\frac{4}{9}$	$9\frac{3}{16}$	$6\frac{1}{8}$	$4\frac{1}{4}$	$7\frac{1}{6}$	$6\frac{1}{10}$
3.	$1\frac{1}{5}$	$5\frac{1}{4}$	$6\frac{1}{8}$	$2\frac{2}{10}$	$3\frac{5}{12}$	$9\frac{3}{16}$
	$4\frac{2}{5}$	$2\frac{1}{4}$	$7\frac{3}{8}$	$8\frac{1}{10}$	$6\frac{1}{12}$	$4\frac{5}{16}$
	$3\frac{1}{5}$	$3\frac{1}{4}$	$2\frac{1}{8}$	$1\frac{3}{10}$	$2\frac{2}{12}$	$3\frac{2}{16}$
4.	$5\frac{3}{4}$	4	$3\frac{5}{8}$	$2\frac{1}{3}$	$\frac{2}{4}$	$7\frac{1}{6}$
	2	$3\frac{1}{2}$	6	$\frac{1}{3}$	$5\frac{1}{4}$	$\frac{1}{6}$

5. Jack is practising for a race. Yesterday he ran $1\frac{5}{8}$ miles and today he ran $2\frac{1}{8}$ miles. How many miles did he run on the two days?

SUBTRACTING FRACTIONS WHICH HAVE THE SAME NAME

Subtract.

5 dolls	12 marbles	9 minutes	10 feet
2 dolls	7 marbles	2 minutes	6 feet
3 dolls	5 marbles	7 minutes	4 feet

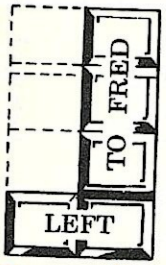
We can subtract each of the above because *they have the same name.* However, we cannot subtract $\begin{array}{r} 12 \text{ marbles} \\ 6 \text{ feet} \\ \hline \end{array}$ because "marbles" and "feet" have different names.

Only things which have the same name can be subtracted. So with fractions.

Rule: **Only fractions with the same name can be subtracted.**

Jimmy had $\frac{5}{8}$ of a chocolate bar. He gave $\frac{3}{8}$ of the bar to Fred. How much of the bar did Jimmy have left?

To find out how much he had left we subtract $\frac{3}{8}$ from $\frac{5}{8}$.



5-eighths $\frac{5}{8}$
3-eighths $\frac{3}{8}$
2-eighths $\frac{2}{8} = \frac{1}{4}$

We can subtract $\frac{3}{8}$ from $\frac{5}{8}$ because they have the same name, *eighths.*

Subtract the numerators,

$5 - 3 = 2$

Write the 2 over the denominator, 8

Change $\frac{2}{8}$ to lowest terms, $\frac{2}{8} = \frac{1}{4}$

So Jimmy had $\frac{1}{4}$ of the chocolate bar left.

Rule: To subtract fractions with the same name subtract the numerators of the fractions and write the difference over the common denominator of the fractions. The answer must always be changed to lowest terms.

Subtract. All answers must be in lowest terms.

1.	$\frac{2}{3}$	$\frac{3}{4}$	$\frac{5}{6}$	$\frac{7}{8}$	$\frac{4}{5}$	$\frac{9}{10}$	$\frac{7}{12}$	$\frac{5}{9}$
	$\frac{1}{3}$	$\frac{1}{4}$	$\frac{3}{6}$	$\frac{1}{8}$	$\frac{2}{5}$	$\frac{3}{10}$	$\frac{5}{12}$	$\frac{2}{9}$
2.	$\frac{4}{6}$	$\frac{7}{10}$	$\frac{11}{16}$	$\frac{11}{12}$	$\frac{6}{7}$	$\frac{13}{16}$	$\frac{9}{20}$	$\frac{15}{32}$
	$\frac{1}{6}$	$\frac{2}{10}$	$\frac{3}{16}$	$\frac{7}{12}$	$\frac{2}{7}$	$\frac{9}{16}$	$\frac{1}{20}$	$\frac{7}{32}$

SUBTRACTING MIXED NUMBERS

At a remnant sale Mrs. Scott bought $11\frac{7}{8}$ yd. of linen and Mrs. Allen bought $9\frac{1}{8}$ yd. How many more yards did Mrs. Scott buy than Mrs. Allen?

To find out how many more yards she bought we *subtract* $9\frac{1}{8}$ from $11\frac{7}{8}$.

$$\begin{array}{r} 11\frac{7}{8} \\ 9\frac{1}{8} \\ \hline 2\frac{6}{8} = 2\frac{3}{4} \end{array}$$

The fractions in the mixed numbers have the same name, so we can subtract them.
Write the mixed numbers as shown.
Subtract the fractions first. $\frac{7}{8} - \frac{1}{8} = \frac{6}{8}$
Write the fraction $\frac{6}{8}$ under the fractions.
Subtract the whole numbers $11 - 9 = 2$
Write the 2 as shown.
Change $\frac{6}{8}$ to lowest terms. $\frac{6}{8} = \frac{3}{4}$
Write the answer as shown.
So Mrs. Scott bought $2\frac{3}{4}$ yd. more than Mrs. Allen.

Subtract. Answers must be in lowest terms.

1.

$6\frac{2}{3}$	$8\frac{5}{6}$	$7\frac{3}{4}$	$9\frac{7}{8}$	$4\frac{7}{10}$	$5\frac{7}{9}$
$2\frac{1}{3}$	$4\frac{1}{6}$	$3\frac{1}{4}$	$6\frac{5}{8}$	$1\frac{3}{10}$	$3\frac{4}{9}$

2.

$3\frac{4}{5}$	$6\frac{5}{8}$	$8\frac{6}{7}$	$10\frac{9}{10}$	$2\frac{7}{8}$	$7\frac{11}{12}$
$1\frac{1}{5}$	$4\frac{1}{8}$	$5\frac{2}{7}$	$3\frac{4}{10}$	$1\frac{1}{8}$	$4\frac{5}{12}$

3.

$11\frac{7}{10}$	$13\frac{3}{8}$	$10\frac{8}{9}$	$9\frac{4}{5}$	$12\frac{9}{16}$	$8\frac{5}{12}$
$6\frac{1}{10}$	$5\frac{1}{8}$	$6\frac{2}{9}$	$2\frac{1}{5}$	$8\frac{7}{16}$	$3\frac{1}{12}$

4.

$15\frac{7}{8}$	$12\frac{3}{10}$	$6\frac{15}{16}$	$2\frac{7}{12}$	$9\frac{17}{20}$	$7\frac{13}{16}$
$7\frac{3}{8}$	$5\frac{1}{10}$	$1\frac{5}{16}$	$1\frac{5}{12}$	$5\frac{13}{20}$	$2\frac{1}{16}$

5.

$4\frac{2}{3}$	$6\frac{1}{2}$	$7\frac{3}{8}$	$2\frac{7}{10}$	$6\frac{5}{8}$	$3\frac{3}{4}$
2	4	3	$\frac{1}{10}$	$\frac{3}{8}$	$\frac{1}{4}$

6. Tom is $3\frac{5}{12}$ ft. tall and his father is $5\frac{11}{12}$ ft. tall. How much taller is Tom's father than Tom?

PROBLEMS USING FRACTIONS AND MIXED NUMBERS

1. Steve is practising the high jump. On Monday he practised for $\frac{1}{6}$ hr., and on Tuesday, $\frac{3}{6}$ hr. How long did Steve practise on the two days?

2. Norma has to walk $\frac{9}{10}$ mi. to get to school and Jane has to walk $\frac{7}{10}$ mi. How much farther has Norma to walk to get to school than Jane?

3. Joe and Tom were picking beans in the garden. Joe picked $\frac{7}{8}$ bu., and Tom picked $\frac{5}{8}$ bu. How much more did Joe pick than Tom?

4. George went fishing and caught three trout. The first trout he caught weighed $\frac{4}{16}$ lb., the second, $\frac{5}{16}$ lb., and the third $\frac{3}{16}$ lb. What was the total weight?

5. On a hike last Saturday the Boy Scouts walked $3\frac{3}{8}$ mi. in the morning, and $4\frac{1}{8}$ mi. in the afternoon. How many miles did the boys travel on their hike?

6. Mr. Fleming has two cows. The red cow gives $4\frac{3}{4}$ gal. of milk a day, and the black cow gives $3\frac{1}{4}$ gal. a day. How much less milk does the black cow give?

7. At the school track meet Roy ran the 100-yard dash in $14\frac{4}{5}$ sec., and Bill ran the same distance in $13\frac{1}{5}$ sec. How much faster did Bill run the dash than Roy?

8. When Mary went to camp last summer she weighed $67\frac{1}{4}$ lb. While at camp she gained $5\frac{1}{4}$ lb. How much did Mary weigh when she got home?

9. Miss Reid had a piece of ribbon $15\frac{7}{12}$ yd. long. She used $4\frac{5}{12}$ yd. to tie a parcel. How many yards did she have left?

10. Nancy gathers the eggs every day on her father's farm. Yesterday she got $8\frac{11}{12}$ doz., and today $6\frac{5}{12}$ doz. How many dozen more did Nancy gather yesterday than she did today?

KEEPING THE TOOLS SHARP

Add. Check each answer.

1.	6054	8909	2798	6166	3849
	4805	1466	9505	5096	7502
	5580	5832	5239	7364	4886
	4937	8557	9607	5040	8053
	5460	2702	5978	2184	2534
	6665	3554	8306	7060	9597

Subtract. Check each answer.

2.	9545	7000	1272	1730	5800
	8998	2987	984	834	1023

3.	34851	42673	56307	40003
	34785	9477	7645	2728

Multiply. Check each answer.

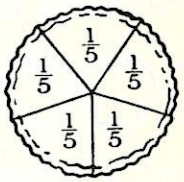
4.	76	59	702	275	483	679
	58	84	72	69	268	104

Divide. Check each answer.

5.	$60\overline{)420}$	$25\overline{)75}$	$44\overline{)396}$	$62\overline{)249}$	$53\overline{)274}$
6.	$34\overline{)97}$	$43\overline{)249}$	$65\overline{)253}$	$59\overline{)435}$	$77\overline{)651}$
7.	$27\overline{)171}$	$67\overline{)542}$	$78\overline{)468}$	$39\overline{)312}$	$46\overline{)230}$
8.	$72\overline{)2592}$	$54\overline{)1423}$	$35\overline{)980}$	$43\overline{)2249}$	
9.	$85\overline{)2890}$	$62\overline{)4727}$	$52\overline{)3498}$	$45\overline{)1136}$	
10.	$24\overline{)1080}$	$55\overline{)2560}$	$73\overline{)5756}$	$64\overline{)4332}$	
11.	$29\overline{)1663}$	$48\overline{)4575}$	$87\overline{)2104}$	$39\overline{)3726}$	
12.	$67\overline{)1571}$	$59\overline{)2755}$	$46\overline{)4387}$	$38\overline{)2394}$	

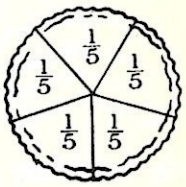
A FRACTION IS ONE WAY OF SHOWING DIVISION

Mildred's mother made 2 small pies which were the same size. She divided the 2 pies among 5 girls. How much pie did each girl get?



Look at the pies on the right. Each girl could get $\frac{1}{5}$ of each pie; so each girl would get $\frac{2}{5}$ of a pie.

We see that "2 pies" is divided by 5.



$$\text{So, } 2 \div 5 = \frac{2}{5}$$

The fraction $\frac{2}{5}$ is a way of showing that 2 is divided by 5.

The line above is 3 in. long. It is divided into 8 equal parts. Use your foot ruler to find how long each part is. You will find that each part is $\frac{3}{8}$ in. long.

We see that 3 in. is divided by 8.

$$\text{So, } 3 \div 8 = \frac{3}{8}$$

The fraction $\frac{3}{8}$ is a way of showing that 3 is divided by 8.

Write the following as fractions. All answers must be in lowest terms.

1.	$2 \div 3$	$5 \div 7$	$6 \div 9$	$8 \div 10$
2.	$4 \div 5$	$10 \div 14$	$12 \div 16$	$7 \div 11$
3.	$2 \div 10$	$7 \div 21$	$9 \div 15$	$15 \div 25$

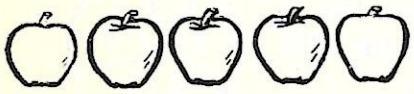
4. Mr. Frost divided 3 chocolate bars among 4 boys. What part of a chocolate bar did each boy get?

5. After a party there were 4 sandwiches left. If these sandwiches were divided among 8 boys, what fraction of a sandwich did each boy get?

6. Miss Frances bought 3 qt. of milk for 12 children. What part of a quart did each child receive?

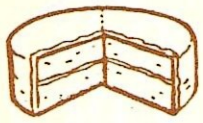
THE MEANING OF AN IMPROPER FRACTION

Numbers like 5, 8, 16, 87 are *whole numbers.*



On the left you see 5 whole apples.

Fractions like $\frac{2}{3}$, $\frac{3}{4}$, $\frac{7}{8}$, $\frac{11}{16}$ are *proper fractions.* A proper fraction is one in which the numerator is smaller than the denominator.



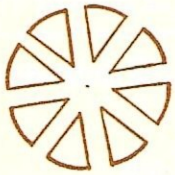
On the left you see $\frac{2}{3}$ of a cake. $\frac{2}{3}$ is a proper fraction.

Numbers like $4\frac{1}{2}$, $6\frac{3}{5}$, $12\frac{3}{8}$ are *mixed numbers.* A mixed number is part whole number and part fraction.

On the left you see $4\frac{1}{2}$ cookies. This means, 4 whole cookies and $\frac{1}{2}$ of another cookie.

A mixed number is greater than a proper fraction and greater than 1 whole.

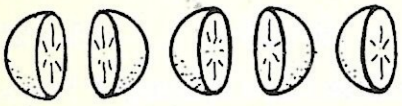
Fractions like $\frac{8}{8}$, $\frac{5}{2}$, $\frac{13}{4}$, are *improper fractions.* An improper fraction is one in which the numerator is the same as, or is larger than the denominator.



On the left you see $\frac{8}{8}$ of a circle. $\frac{8}{8}$ means "8 eighths."

You can see that if the $\frac{8}{8}$ of the circle are fitted together they make 1 whole circle.

$$\boxed{\text{So, } \frac{8}{8} = 1}$$



On the left you see $\frac{5}{2}$ oranges. $\frac{5}{2}$ means "5 halves." So you see 5 half oranges. If you put two halves together you get 1 whole orange. Put two more halves together and you get another whole orange. Then there will be $\frac{1}{2}$ orange left. $\frac{5}{2}$ oranges is the same as $2\frac{1}{2}$ oranges. $\boxed{\text{So, } \frac{5}{2} = 2\frac{1}{2}}$

An improper fraction may be changed to a whole number or to a mixed number.

CHANGING IMPROPER FRACTIONS TO WHOLE NUMBERS OR TO MIXED NUMBERS

On page 124 we saw that the improper fraction $\frac{8}{8} = 1$
A short way to change the improper fraction, $\frac{8}{8}$, to a whole number is to divide the numerator by the denominator. $8 \div 8 = 1$. In the same way, $\frac{18}{6} = 3$, because $18 \div 3 = 6$
On page 124 we also saw that the improper fraction $\frac{5}{2} = 2\frac{1}{2}$.
A short way to change the improper fraction, $\frac{5}{2}$, to a mixed number is to divide the numerator, 5, by the denominator, 2, and to write the remainder, 1, as the numerator of a fraction with the same denominator, 2, as the improper fraction.

So, $\frac{5}{2} = 2\frac{1}{2}$

$$2)\overline{5}\quad 2\tfrac{1}{2}$$

Rule: To change an improper fraction to a whole number or to a mixed number divide the numerator of the improper fraction by its denominator. Then write the remainder, if there is one, as the numerator of a fraction with the same denominator as the denominator of the improper fraction.

1. $\frac{1}{2}$, 7, $4\frac{3}{5}$, $\frac{11}{3}$, $\frac{5}{7}$, 39, $\frac{16}{4}$, $9\frac{1}{6}$, $\frac{17}{8}$, $\frac{1}{12}$, $\frac{14}{5}$, $\frac{22}{7}$

Which of the above are (a) whole numbers? (b) proper fractions? (c) mixed numbers? (d) improper fractions?

2. Change the improper fractions below to whole or mixed numbers:

$\frac{6}{6}$, $\frac{7}{2}$, $\frac{20}{5}$, $\frac{11}{3}$, $\frac{23}{4}$, $\frac{35}{7}$, $\frac{17}{6}$, $\frac{25}{8}$

3. Change these improper fractions to mixed numbers and reduce the fractions in the answers to lowest terms:

$\frac{6}{4}$, $\frac{14}{6}$, $\frac{30}{8}$, $\frac{44}{10}$, $\frac{27}{12}$, $\frac{66}{16}$, $\frac{48}{15}$, $\frac{136}{20}$

4. At Jean's birthday party her mother served $\frac{24}{4}$ pints of ice-cream. How many whole pints was that?

5. Roy had a string $\frac{1}{8}$ of a mile long with which he measured the distance from his home to the school. He found that the distance was $\frac{13}{8}$ mi. How far did he live from the school?

WRITING THE SUM AS A MIXED OR A WHOLE NUMBER

May, June, and Ella picked blueberries yesterday. May picked $\frac{3}{4}$ gal., June picked $\frac{1}{4}$ gal., and Ella picked $\frac{2}{4}$ gal. How many gallons of blueberries did the three girls pick?

To find how many gallons they picked we *add* $\frac{3}{4}$, $\frac{1}{4}$, and $\frac{2}{4}$.

$\frac{3}{4}$
$\frac{1}{4}$
$\frac{2}{4}$
$\frac{6}{4} = 1\frac{2}{4} = 1\frac{1}{2}$

We can add the fractions because they have the same name, *fourths*.

Write the fractions as shown.

Add the numerators. $3+1+2=6$

Write the 6 over the denominator, 4, which gives the improper fraction, $\frac{6}{4}$.

Change the improper fraction, $\frac{6}{4}$, to the mixed number, $1\frac{2}{4}$

Change the fraction, $\frac{2}{4}$, to lowest terms, $\frac{2}{4} = \frac{1}{2}$

So the three girls picked $1\frac{1}{2}$ gallons of blueberries.

Add. Each answer must be in lowest terms.

1.

$\frac{3}{4}$	$\frac{4}{5}$	$\frac{1}{8}$	$\frac{5}{6}$	$\frac{3}{10}$	$\frac{5}{9}$	$\frac{11}{12}$	$\frac{5}{16}$
$\frac{2}{4}$	$\frac{2}{5}$	$\frac{7}{8}$	$\frac{3}{6}$	$\frac{7}{10}$	$\frac{7}{9}$	$\frac{5}{12}$	$\frac{13}{16}$

2.

$\frac{2}{3}$	$\frac{5}{6}$	$\frac{1}{8}$	$\frac{7}{10}$	$\frac{4}{5}$	$\frac{6}{12}$	$\frac{4}{9}$	$\frac{6}{7}$
$\frac{1}{3}$	$\frac{2}{6}$	$\frac{5}{8}$	$\frac{3}{10}$	$\frac{3}{5}$	$\frac{11}{12}$	$\frac{7}{9}$	$\frac{5}{7}$
$\frac{2}{3}$	$\frac{5}{6}$	$\frac{7}{8}$	$\frac{6}{10}$	$\frac{1}{5}$	$\frac{7}{12}$	$\frac{4}{9}$	$\frac{3}{7}$

3.

$\frac{3}{8}$	$\frac{6}{9}$	$\frac{5}{6}$	$\frac{4}{7}$	$\frac{9}{10}$	$\frac{5}{12}$	$\frac{11}{16}$	$\frac{7}{8}$
$\frac{5}{8}$	$\frac{7}{9}$	$\frac{5}{6}$	$\frac{3}{7}$	$\frac{7}{10}$	$\frac{9}{12}$	$\frac{13}{16}$	$\frac{6}{8}$
$\frac{7}{8}$	$\frac{5}{9}$	$\frac{5}{6}$	$\frac{5}{7}$	$\frac{7}{10}$	$\frac{1}{12}$	$\frac{15}{16}$	$\frac{7}{8}$

4. Mrs. Ellis bought 3 turnips at the market. One turnip weighed $\frac{11}{16}$ lb.; another $\frac{9}{16}$ lb.; and the other, $\frac{6}{16}$ lb. How much did the three turnips weigh altogether?

5. Last evening Sally studied her English lesson for $\frac{3}{6}$ hr.; her arithmetic, $\frac{2}{6}$ hr.; and her geography, $\frac{3}{6}$ hr. How long did Sally study last evening?

ADDING MIXED NUMBERS WITH CARRYING

Ted earns money for himself by raising chickens. Last Saturday he killed and dressed two chickens and sold them. One chicken weighed $4\frac{11}{16}$ lb., and the other weighed $5\frac{9}{16}$ lb. How much did the two chickens weigh?

To find out how much the two chickens weighed we *add* $4\frac{11}{16}$ and $5\frac{9}{16}$.

Write the mixed numbers as shown.

The fractions have the same name, *sixteenths*, so we add them.

Add the fractions, $\frac{11}{16}+\frac{9}{16}=\frac{20}{16}$

Change $\frac{20}{16}$ to $1\frac{4}{16}$

Write the $\frac{4}{16}$ under the fractions. CARRY the whole number, 1, and add it to the whole numbers, 4 and 5. $1+4+5=10$.

Write the 10 under the whole numbers.

Change $\frac{4}{16}$ to lowest terms, $\frac{4}{16}=\frac{1}{4}$

So the two chickens weighed $10\frac{1}{4}$ lb.

$$\begin{array}{r} 4\frac{11}{16} \\ 5\frac{9}{16} \\ \hline 10\frac{4}{16}=10\frac{1}{4} \end{array}$$

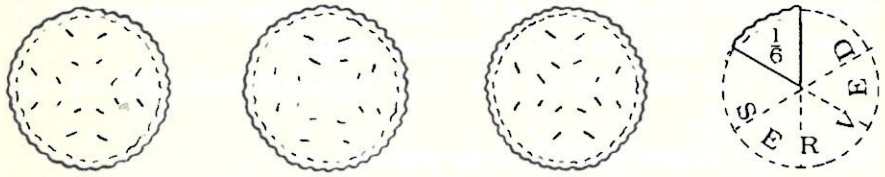
Add and check. Each answer must be in lowest terms.

1.	$2\frac{5}{6}$	$4\frac{4}{7}$	$5\frac{3}{4}$	$3\frac{7}{8}$	$1\frac{1}{3}$	$6\frac{9}{10}$
	$3\frac{2}{6}$	$1\frac{5}{7}$	$2\frac{3}{4}$	$6\frac{5}{8}$	$2\frac{2}{3}$	$5\frac{7}{10}$
2.	$6\frac{4}{5}$	$7\frac{1}{2}$	$3\frac{8}{10}$	$\frac{7}{12}$	$5\frac{13}{16}$	$12\frac{3}{8}$
	$4\frac{3}{5}$	$5\frac{1}{2}$	$\frac{6}{10}$	$4\frac{9}{12}$	$6\frac{15}{16}$	$\frac{5}{8}$
3.	$2\frac{3}{4}$	$5\frac{4}{5}$	$4\frac{7}{8}$	$\frac{9}{10}$	$3\frac{11}{16}$	$2\frac{7}{12}$
	$4\frac{1}{4}$	$1\frac{3}{5}$	$3\frac{5}{8}$	$4\frac{7}{10}$	$\frac{15}{16}$	$6\frac{8}{12}$
	$3\frac{3}{4}$	$7\frac{3}{5}$	$6\frac{1}{8}$	$7\frac{4}{10}$	$7\frac{10}{16}$	$\frac{11}{12}$

4. Fanny was helping her mother hang out the washing. Fanny's mother had $2\frac{11}{12}$ doz. clothes-pins in her basket and Fanny had $1\frac{7}{12}$ doz. in her basket. How many clothes-pins did they have altogether?

SUBTRACTING A FRACTION FROM A WHOLE NUMBER

Mrs. Cobb baked 4 pies. At lunch she served $\frac{5}{6}$ of one pie. How much pie did she have left?



From the pictures above you see that there are $3\frac{1}{6}$ pies left. A short way to find how much pie is left is to *subtract* $\frac{5}{6}$ from 4. Write the whole number and fraction as shown. There is no fraction above $\frac{5}{6}$ from which to subtract it.

$$\begin{array}{r} 4 = 3\frac{6}{6} \\ \frac{5}{6} = \frac{5}{6} \\ \hline 3\frac{1}{6} \end{array}$$

Borrow 1 whole from the 4 and change the 1 whole to $\frac{6}{6}$ which has the same denominator as $\frac{5}{6}$. So, $4 = 3\frac{6}{6}$

Now subtract $\frac{5}{6}$ from $3\frac{6}{6}$

Subtract the fractions. $\frac{6}{6} - \frac{5}{6} = \frac{1}{6}$

Bring down the 3.

So Mrs. Cobb had $3\frac{1}{6}$ pies left.

Subtract. Check each exercise.

1.	3	5	9	7	8	6
	$\frac{1}{4}$	$\frac{2}{3}$	$\frac{3}{5}$	$\frac{1}{6}$	$\frac{7}{10}$	$\frac{5}{8}$
2.	5	10	12	9	15	13
	$\frac{4}{7}$	$\frac{3}{4}$	$\frac{5}{7}$	$\frac{7}{12}$	$\frac{9}{16}$	$\frac{3}{10}$
3.	11	14	16	1	12	1
	$\frac{4}{5}$	$\frac{11}{12}$	$\frac{3}{8}$	$\frac{1}{16}$	$\frac{9}{20}$	$\frac{7}{9}$

4. Andy was going to walk to his Aunt Mary's, 3 mi. from his home. When he had walked $\frac{7}{8}$ of a mile, a friend picked him up and drove him to his aunt's. How many miles did Andy drive?

5. Mrs. Beatty bought 2 lb. of beefsteak. She cooked $\frac{3}{4}$ lb. for dinner. How many pounds of steak did she have left?

SUBTRACTING A MIXED NUMBER FROM A WHOLE NUMBER

Tony and Frank like to swim. Yesterday Tony swam across the pond in 7 min., but Frank swam the same distance in $4\frac{3}{5}$ min. How much longer did Tony take to swim across the pond than Frank?

To find how much longer Tony took we *subtract* $4\frac{3}{5}$ from 7. Write the whole number and the mixed number as shown. There is no fraction above $\frac{3}{5}$ from which to subtract it. Borrow 1 whole from 7 and change the 1 whole to $\frac{5}{5}$ which has the same denominator as $\frac{3}{5}$.

So $7 = 6\frac{5}{5}$

$$\begin{array}{r} 7 = 6\frac{5}{5} \\ 4\frac{3}{5} = 4\frac{3}{5} \\ \hline 2\frac{2}{5} \end{array}$$

Now subtract $4\frac{3}{5}$ from $6\frac{5}{5}$

Subtract the fractions. $\frac{5}{5} - \frac{3}{5} = \frac{2}{5}$

Subtract the whole numbers. $6 - 4 = 2$

So Tony took $2\frac{2}{5}$ min. longer to swim across the pond.

Subtract. Check each exercise.

1.	4	8	6	9	3	5
	$1\frac{2}{3}$	$5\frac{1}{4}$	$2\frac{3}{8}$	$6\frac{2}{5}$	$1\frac{5}{6}$	$2\frac{3}{10}$
2.	7	6	8	10	14	12
	$5\frac{1}{2}$	$2\frac{5}{7}$	$4\frac{4}{9}$	$6\frac{7}{12}$	$9\frac{3}{16}$	$7\frac{5}{8}$
3.	15	11	13	7	21	5
	$4\frac{6}{7}$	$2\frac{1}{8}$	$7\frac{3}{5}$	$6\frac{9}{10}$	$13\frac{5}{12}$	$4\frac{4}{9}$

4. Sam's father was building a shelf in the kitchen. He cut a piece $4\frac{3}{4}$ ft. long from a board which was 8 ft. long. How long was the piece that was left?

5. There were 10 tons of coal in Mr. Burns' coal bin on February 1. If he used $3\frac{2}{5}$ tons during February, how many tons were left in the bin?

SUBTRACTING FRACTIONS OR MIXED NUMBERS FROM MIXED NUMBERS WITH BORROWING

Mr. Fraser had $3\frac{3}{8}$ gal. of molasses in a large can. He poured molasses from the can into a jug which held $\frac{7}{8}$ gal. How many gallons of molasses were left in the can?

To find how many gallons were left in the can we *subtract* $\frac{7}{8}$ from $3\frac{3}{8}$. Write the mixed number and the fraction as shown.

$$3\tfrac{3}{8} = 2\tfrac{11}{8}$$
$$\tfrac{7}{8} = \tfrac{7}{8}$$
$$2\ \tfrac{4}{8} = 2\tfrac{1}{2}$$

We cannot subtract $\frac{7}{8}$ from $\frac{3}{8}$ because $\frac{7}{8}$ is more than $\frac{3}{8}$.

Borrow 1 whole from 3 and change the 1 whole to $\frac{8}{8}$. Add the $\frac{8}{8}$ to $\frac{3}{8}$ making $\frac{11}{8}$.

So $3\frac{3}{8} = 2\frac{11}{8}$

Now subtract, $\frac{11}{8} - \frac{7}{8} = \frac{4}{8}$. Bring down the 2.

Change $\frac{4}{8}$ to lowest terms. $\frac{4}{8} = \frac{1}{2}$

So there were $2\frac{1}{2}$ gal. left in the can.

Tell how this is done. *Subtract.*

$$10\tfrac{1}{5} = 9\tfrac{6}{5}$$
$$3\tfrac{4}{5} = 3\tfrac{4}{5}$$
$$6\tfrac{2}{5}$$

Subtract and check. Answers must be in lowest terms.

1.

$2\frac{1}{4}$	$5\frac{1}{3}$	$4\frac{2}{5}$	$7\frac{1}{6}$	$3\frac{4}{9}$	$6\frac{1}{8}$
$\frac{3}{4}$	$\frac{2}{3}$	$\frac{3}{5}$	$\frac{5}{6}$	$\frac{7}{9}$	$\frac{3}{8}$

2.

$4\frac{2}{7}$	$7\frac{1}{8}$	$14\frac{3}{6}$	$12\frac{3}{5}$	$9\frac{3}{10}$	$13\frac{2}{5}$
$\frac{5}{7}$	$\frac{7}{8}$	$\frac{5}{6}$	$\frac{4}{5}$	$\frac{9}{10}$	$\frac{3}{5}$

3.

$3\frac{2}{5}$	$6\frac{1}{3}$	$7\frac{2}{4}$	$11\frac{2}{9}$	$15\frac{3}{7}$	$12\frac{3}{8}$
$1\frac{4}{5}$	$2\frac{2}{3}$	$4\frac{3}{4}$	$3\frac{5}{9}$	$8\frac{6}{7}$	$7\frac{5}{8}$

4.

$24\frac{4}{7}$	$32\frac{1}{10}$	$47\frac{5}{9}$	$38\frac{5}{16}$	$54\frac{7}{12}$	$42\frac{7}{16}$
$17\frac{6}{7}$	$16\frac{3}{10}$	$31\frac{7}{9}$	$17\frac{9}{16}$	$29\frac{11}{12}$	$39\frac{11}{16}$

5. Mary is $9\frac{1}{12}$ yr. old. Bill is $7\frac{7}{12}$ yr. old. How much younger is Bill than Mary?

PRACTICE WITH FRACTIONS

Change these fractions to lowest terms.

1. $\frac{2}{6}$ $\frac{6}{8}$ $\frac{8}{10}$ $\frac{9}{12}$ $\frac{10}{16}$ $\frac{21}{24}$

Change these improper fractions to whole or to mixed numbers.

2. $\frac{8}{3}$ $\frac{14}{4}$ $\frac{35}{7}$ $\frac{26}{5}$ $\frac{48}{8}$ $\frac{39}{12}$

Add. Each answer must be in lowest terms.

3.

$\frac{1}{5}$	$\frac{3}{8}$	$\frac{4}{10}$	$\frac{7}{16}$	$\frac{3}{7}$	$\frac{2}{12}$
$\frac{2}{5}$	$\frac{2}{8}$	$\frac{1}{10}$	$\frac{5}{16}$	$\frac{2}{7}$	$\frac{1}{12}$
$\frac{1}{5}$	$\frac{1}{8}$	$\frac{3}{10}$	$\frac{1}{16}$	$\frac{1}{7}$	$\frac{7}{12}$

4.

$1\frac{1}{4}$	$4\frac{1}{6}$	$6\frac{2}{9}$	$5\frac{3}{10}$	$8\frac{5}{12}$	$9\frac{5}{16}$
$3\frac{1}{4}$	$2\frac{2}{6}$	$3\frac{4}{9}$	$2\frac{1}{10}$	$2\frac{3}{12}$	$4\frac{1}{16}$
$2\frac{1}{4}$	$5\frac{1}{6}$	$1\frac{1}{9}$	$7\frac{2}{10}$	$3\frac{1}{12}$	$2\frac{9}{16}$

5.

$\frac{7}{8}$	$\frac{9}{10}$	$\frac{3}{4}$	$\frac{4}{5}$	$\frac{5}{9}$	$\frac{9}{16}$
$\frac{3}{8}$	$\frac{7}{10}$	$\frac{1}{4}$	$\frac{3}{5}$	$\frac{7}{9}$	$\frac{5}{16}$

6.

$\frac{1}{2}$	$\frac{5}{6}$	$\frac{7}{10}$	$\frac{11}{16}$	$\frac{3}{8}$	$\frac{5}{12}$
$\frac{1}{2}$	$\frac{2}{6}$	$\frac{9}{10}$	$\frac{15}{16}$	$\frac{7}{8}$	$\frac{1}{12}$
$\frac{1}{2}$	$\frac{5}{6}$	$\frac{9}{10}$	$\frac{6}{16}$	$\frac{5}{8}$	$\frac{11}{12}$

7.

$3\frac{5}{6}$	$1\frac{3}{10}$	$6\frac{7}{8}$	$9\frac{4}{5}$	$8\frac{5}{12}$	$5\frac{7}{16}$
$2\frac{5}{6}$	$5\frac{9}{10}$	$8\frac{7}{8}$	$7\frac{1}{5}$	$4\frac{11}{12}$	$9\frac{15}{16}$

8.

$2\frac{1}{8}$	$6\frac{4}{7}$	$10\frac{8}{9}$	$5\frac{8}{10}$	$8\frac{1}{12}$	$\frac{9}{16}$
$1\frac{7}{8}$	$3\frac{6}{7}$	$2\frac{7}{9}$	$8\frac{7}{10}$	$\frac{11}{12}$	$4\frac{13}{16}$
$3\frac{5}{8}$	$4\frac{3}{7}$	$7\frac{5}{9}$	$\frac{9}{10}$	$7\frac{3}{12}$	$6\frac{11}{16}$

PRACTICE IN SUBTRACTION OF FRACTIONS

Subtract. Each answer must be in lowest terms.

1.	$\frac{3}{4}$ $\frac{1}{4}$	$\frac{7}{10}$ $\frac{3}{10}$	$\frac{5}{8}$ $\frac{3}{8}$	$\frac{7}{9}$ $\frac{2}{9}$	$\frac{9}{16}$ $\frac{5}{16}$	$\frac{17}{20}$ $\frac{11}{20}$
2.	$6\frac{7}{8}$ $2\frac{5}{8}$	$9\frac{5}{7}$ $4\frac{2}{7}$	$12\frac{3}{10}$ $6\frac{1}{10}$	$4\frac{11}{12}$ $1\frac{7}{12}$	$8\frac{2}{3}$ 6	$7\frac{15}{16}$ $\frac{9}{16}$
3.	5 $\frac{1}{3}$	7 $\frac{5}{6}$	9 $\frac{3}{8}$	13 $\frac{9}{10}$	1 $\frac{3}{4}$	15 $\frac{7}{12}$
4.	8 $\frac{3}{5}$	14 $\frac{5}{9}$	1 $\frac{1}{6}$	19 $\frac{9}{16}$	6 $\frac{11}{20}$	12 $\frac{8}{15}$
5.	4 $1\frac{1}{4}$	3 $2\frac{3}{7}$	8 $5\frac{2}{3}$	6 $4\frac{1}{2}$	7 $3\frac{5}{8}$	9 $2\frac{1}{6}$
6.	5 $3\frac{5}{9}$	11 $4\frac{5}{12}$	17 $9\frac{3}{10}$	15 $6\frac{7}{16}$	23 $13\frac{3}{5}$	18 $9\frac{7}{20}$
7.	$6\frac{1}{3}$ $\frac{2}{3}$	$2\frac{3}{8}$ $\frac{7}{8}$	$4\frac{1}{6}$ $\frac{5}{6}$	$5\frac{3}{10}$ $\frac{9}{10}$	$8\frac{5}{9}$ $\frac{8}{9}$	$3\frac{3}{5}$ $\frac{4}{5}$
8.	$9\frac{2}{7}$ $\frac{6}{7}$	$10\frac{1}{4}$ $\frac{3}{4}$	$13\frac{1}{8}$ $\frac{7}{8}$	$8\frac{5}{12}$ $\frac{11}{12}$	$12\frac{1}{10}$ $\frac{9}{10}$	$14\frac{3}{16}$ $\frac{9}{16}$
9.	$3\frac{2}{5}$ $1\frac{3}{5}$	$6\frac{7}{10}$ $2\frac{9}{10}$	$9\frac{5}{8}$ $4\frac{7}{8}$	$7\frac{2}{9}$ $5\frac{7}{9}$	$8\frac{4}{7}$ $4\frac{6}{7}$	$11\frac{3}{10}$ $6\frac{7}{10}$
10.	$12\frac{5}{8}$ $5\frac{7}{8}$	$15\frac{7}{12}$ $6\frac{11}{12}$	$24\frac{1}{8}$ $13\frac{3}{8}$	$33\frac{5}{16}$ $19\frac{7}{16}$	$11\frac{9}{20}$ $8\frac{13}{20}$	$16\frac{7}{32}$ $7\frac{15}{32}$

PROBLEMS USING FRACTIONS

1. Jack walks $\frac{5}{8}$ of a mile to school every morning. On his way home he takes a longer way, which is $\frac{7}{8}$ of a mile. How far does he walk to and from school?

2. There are 40 pupils in Miss Track's class. $\frac{3}{5}$ of them are girls. How many girls are there in the class?

3. Bill's father bought a 5 gal. can of motor oil. He used $\frac{3}{4}$ gal. in his tractor. How many gallons of oil were left in the can?

4. Last Saturday Tom worked $1\frac{5}{6}$ hr. cleaning the cellar and $1\frac{2}{6}$ hr. splitting wood. How many hours did Tom work?

5. Mr. Gregg, the florist, picked 6 doz. roses in his hot-house. He sold $2\frac{1}{2}$ doz. roses to a customer. How many roses did he have left?

6. Mary bought $\frac{3}{4}$ lb. of fudge. If the fudge was 48¢ a pound, how much did Mary pay for her fudge?

7. Mrs. Kent was buying a leg of lamb. She looked at one that weighed $7\frac{1}{8}$ lb. and one that weighed $\frac{7}{8}$ lb. less. How much did the second leg of lamb weigh?

8. Mrs. Lott wanted a turkey for a special dinner. The butcher showed her a turkey that weighed $13\frac{5}{16}$ lb. and another that weighed $10\frac{7}{16}$ lb. What was the difference in the weights of the turkeys?

9. Bob's mother was making sandwiches for the church fair. She made $3\frac{5}{12}$ doz. ham sandwiches, $2\frac{11}{12}$ doz. cheese sandwiches and $1\frac{1}{12}$ doz. beef sandwiches. How many sandwiches did she make altogether?

10. Tony's dog weighs $42\frac{3}{8}$ lb. and Dick's dog weighs $28\frac{5}{8}$ lb. How much heavier is Tony's dog?

11. Mr. Frame burned $2\frac{3}{4}$ cords of wood in January, $3\frac{3}{4}$ cords in February and $2\frac{1}{4}$ cords in March. How many cords of wood did he burn in the three months?

KEEPING THE TOOLS SHARP

Add. Check each answer.

1.	4544	3573	9836	6929	7428
	9887	9875	5357	7583	2889
	2073	7656	6769	5864	4944
	5500	4575	4595	3678	7656
	4862	8843	7756	8355	8598
	6989	4286	6849	4674	2837
2.	7865	4436	3567	7768	9585
	4397	9752	5836	5554	4649
	3647	3375	8783	8682	6242
	9275	4787	6649	2296	8684
	4853	3462	9897	5753	6475
	2479	4398	3528	4267	7387

Subtract. Check each answer.

3.	1442	1584	1351	1926	1263
	765	987	866	949	878
4.	1180	1340	1600	3000	1703
	744	542	845	1183	907
5.	7341	5253	8527	4275	6682
	3852	2976	6978	3479	5896

6.	63727	72546	26261	55733
	29463	59167	21393	49858
7.	30002	74040	50700	60401
	3688	45073	41825	50807
8.	64172	31004	91292	53481
	38166	20259	34794	43589

KEEPING THE TOOLS SHARP

Multiply. Check each answer.

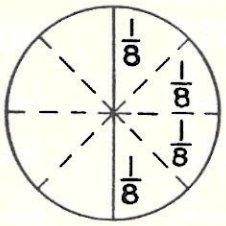
1.	612 × 8	407 × 5	631 × 9	890 × 6	906 × 7
2.	258 × 4	642 × 6	475 × 7	527 × 9	439 × 8
3.	2687 × 3	1478 × 9	5728 × 8	3075 × 6	4823 × 7
4.	82 × 60	79 × 57	419 × 28	507 × 34	609 × 92
5.	619 × 300	736 × 280	583 × 406	276 × 164	837 × 579
6.	\$1.47 × 5	\$6.04 × 4	\$2.95 × 7	\$5.84 × 6	\$4.58 × 3
7.	\$ .35 × 19	\$ .94 × 28	\$1.68 × 45	\$3.76 × 73	\$2.69 × 69

Divide. Check each answer.

8.	$43\overline{)1075}$	$62\overline{)2103}$	$38\overline{)1292}$	$45\overline{)1225}$
9.	$34\overline{)2208}$	$23\overline{)1295}$	$17\overline{)1513}$	$15\overline{)1283}$
10.	$18\overline{)1375}$	$53\overline{)5271}$	$24\overline{)2276}$	$83\overline{)8190}$
11.	$25\overline{)7900}$	$64\overline{)30231}$	$48\overline{)30192}$	$39\overline{)24352}$
12.	$92\overline{)32200}$	$16\overline{)11845}$	$37\overline{)24798}$	$56\overline{)16258}$
13.	$83\overline{)50215}$	$75\overline{)23129}$	$15\overline{)10594}$	$29\overline{)26227}$

CHANGING A FRACTION TO HIGHER TERMS

The circle on the right is divided into 8 equal parts.



We can see that $\frac{1}{2}$ of the circle is the same as $\frac{4}{8}$ of the circle. So $\frac{1}{2}=\frac{4}{8}$. These fractions have the *same value* or are the *same size*. The terms of the fraction, $\frac{1}{2}$, are 1 and 2; the terms of the fraction, $\frac{4}{8}$, are 4 and 8. The terms of $\frac{4}{8}$ are *higher* than the terms of $\frac{1}{2}$ although the fractions, $\frac{4}{8}$ and $\frac{1}{2}$, have the *same value*.

Look at $\frac{1}{2}=\frac{4}{8}$ again. We can see that if we multiply both the numerator and the denominator of $\frac{1}{2}$ by 4 we get $\frac{4}{8}$ which has the same value as $\frac{1}{2}$.

$$\frac{1}{2}=\frac{1\times4}{2\times4}=\frac{4}{8}$$

The line above is divided into 5 equal parts by the long vertical lines and into 10 equal parts by the short vertical lines.

We can see that $\frac{3}{5}$ of the line is the same as $\frac{6}{10}$ of the line. So $\frac{3}{5}=\frac{6}{10}$. These fractions have the *same value* but the terms of $\frac{6}{10}$ are higher than the terms of $\frac{3}{5}$.

Look at $\frac{3}{5}=\frac{6}{10}$ again. We can see that if we multiply both the numerator and the denominator of $\frac{3}{5}$ by 2, we get $\frac{6}{10}$ which has the same value as $\frac{3}{5}$.

$$\frac{3}{5}=\frac{3\times2}{5\times2}=\frac{6}{10}$$

Remember this rule: If we multiply both the numerator and the denominator of a fraction by the same number, the value of the fraction does not change; only the terms of the fraction change.

When we change a fraction to higher terms we do not make the value of the fraction greater. We only use larger numbers for the numerator and denominator.

CHANGING A FRACTION TO HIGHER TERMS

Ann had a piece of taffy $\frac{2}{3}$ ft. long. How many twelfths of a foot long was the taffy?

To find out we must change $\frac{2}{3}$ to twelfths.

$\frac{2}{3} = \frac{?}{12}$

Think,

"3's in 12 are 4"

"$4 \times 2 = 8$"

Write $\frac{2}{3} = \frac{8}{12}$

To find the number by which the denominator 3 must be multiplied to give 12, *Think, "3's in 12 are 4."* If the value of the fractions is to remain the same, we must multiply the numerator 2, by 4 also. *Think,* $2 \times 4 = 8$."

So $\frac{2}{3}$ has been changed to $\frac{8}{12}$

So Ann's piece of taffy was $\frac{8}{12}$ ft. long.

Change each fraction below to a fraction of higher terms with the denominator shown.

1.	$\frac{1}{2} = \frac{}{4}$	$\frac{1}{4} = \frac{}{8}$	$\frac{1}{3} = \frac{}{9}$	$\frac{1}{5} = \frac{}{10}$
2.	$\frac{3}{4} = \frac{}{12}$	$\frac{2}{3} = \frac{}{6}$	$\frac{2}{5} = \frac{}{10}$	$\frac{5}{8} = \frac{}{16}$
3.	$\frac{1}{6} = \frac{}{18}$	$\frac{3}{4} = \frac{}{16}$	$\frac{5}{6} = \frac{}{24}$	$\frac{2}{9} = \frac{}{36}$
4.	$\frac{7}{8} = \frac{}{16}$	$\frac{3}{5} = \frac{}{20}$	$\frac{2}{7} = \frac{}{21}$	$\frac{5}{12} = \frac{}{36}$
5.	$\frac{2}{3} = \frac{}{15}$	$\frac{3}{8} = \frac{}{32}$	$\frac{4}{5} = \frac{}{25}$	$\frac{3}{4} = \frac{}{24}$

SOME THINGS TO REMEMBER

Fractions like $\frac{1}{8}$, $\frac{3}{8}$, and $\frac{5}{8}$ which have the *same name* or the *same denominator* are called *like fractions.*

Fractions like $\frac{1}{2}$ and $\frac{3}{4}$ which have *different names* or *different denominators* are called *unlike fractions.*

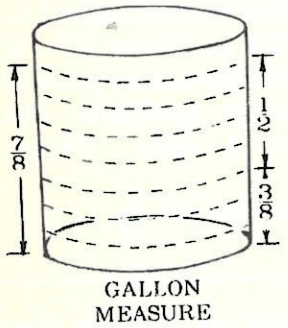
Before unlike fractions can be added or subtracted, their names (denominators) must be made the same. Then they will have the same *common denominator.*

Important. The common denominator (name) of two or more unlike fractions is the largest denominator if the other denominators divide into it evenly.

ADDING UNLIKE FRACTIONS – SUM LESS THAN ONE

In the spring Neil and Jim tap trees for maple sap. One morning Neil got $\frac{1}{2}$ gal. of maple sap and Jim got $\frac{3}{8}$ gal. How much maple sap did they get altogether?

To find how much maple sap they got we *add* $\frac{1}{2}$ and $\frac{3}{8}$.



GALLON MEASURE

$\frac{1}{2} = \frac{4}{8}$
$\frac{3}{8} = \frac{3}{8}$
$\frac{7}{8}$

Before we can add $\frac{1}{2}$ and $\frac{3}{8}$ they must have the same name or a *common denominator*. Since the denominator 2 divides evenly into the denominator 8, 8 is the common denominator.

Change $\frac{1}{2}$ to eighths. $\frac{1}{2} = \frac{4}{8}$

Add. $\frac{4}{8} + \frac{3}{8} = \frac{7}{8}$

So Neil and Jim got $\frac{7}{8}$ gal. altogether.

Add. Each answer must be in lowest terms.

1.

$\frac{1}{2}$	$\frac{1}{6}$	$\frac{2}{3}$	$\frac{1}{4}$	$\frac{3}{10}$	$\frac{1}{9}$	$\frac{1}{2}$	$\frac{2}{5}$
$\frac{1}{4}$	$\frac{1}{2}$	$\frac{1}{6}$	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{2}{3}$	$\frac{5}{12}$	$\frac{3}{10}$

2.

$\frac{1}{8}$	$\frac{7}{10}$	$\frac{1}{2}$	$\frac{4}{9}$	$\frac{5}{16}$	$\frac{1}{2}$	$\frac{1}{8}$	$\frac{2}{9}$
$\frac{3}{16}$	$\frac{1}{5}$	$\frac{5}{16}$	$\frac{1}{3}$	$\frac{3}{8}$	$\frac{1}{10}$	$\frac{3}{4}$	$\frac{2}{3}$

3.

$\frac{1}{6}$	$\frac{2}{9}$	$\frac{1}{9}$	$\frac{3}{8}$	$\frac{1}{5}$	$\frac{1}{3}$	$\frac{1}{2}$	$\frac{3}{8}$
$\frac{1}{2}$	$\frac{1}{3}$	$\frac{1}{3}$	$\frac{1}{4}$	$\frac{1}{10}$	$\frac{1}{6}$	$\frac{1}{12}$	$\frac{1}{4}$
$\frac{1}{6}$	$\frac{1}{9}$	$\frac{4}{9}$	$\frac{1}{8}$	$\frac{3}{10}$	$\frac{1}{12}$	$\frac{1}{6}$	$\frac{3}{16}$

4.

$2\frac{3}{16}$	$5\frac{5}{6}$	$4\frac{1}{8}$	$2\frac{3}{10}$	$8\frac{7}{16}$	$6\frac{1}{3}$	$4\frac{1}{2}$	$3\frac{1}{3}$
$3\frac{1}{2}$	$1\frac{1}{12}$	$6\frac{9}{16}$	$7\frac{3}{5}$	$3\frac{3}{8}$	$7\frac{2}{9}$	$8\frac{3}{16}$	$10\frac{7}{12}$

5. Sally bought $\frac{1}{2}$ lb. of candy and Leo bought $\frac{3}{16}$ lb. of candy. How much candy did they buy altogether?

6. Mary had 2 pieces of ribbon. One piece was $\frac{1}{6}$ yd. long, and the other piece was $\frac{2}{3}$ yd. long. How long were the two pieces together?

ADDING UNLIKE FRACTIONS—SUM IS ONE OR MORE

Mrs. Black bought 3 turnips at the market yesterday. One turnip weighed $\frac{1}{2}$ lb.; another, $\frac{13}{16}$ lb.; and the other, $\frac{7}{8}$ lb. How many pounds of turnips did she buy?

To find how many pounds of turnips she bought we *add*, $\frac{1}{2}$, $\frac{13}{16}$, and $\frac{7}{8}$.

$$\frac{1}{2} = \frac{8}{16}$$
$$\frac{13}{16} = \frac{13}{16}$$
$$\frac{7}{8} = \frac{14}{16}$$
$$\frac{35}{16} = 2\frac{3}{16}$$

Before we can add $\frac{1}{2}$, $\frac{13}{16}$, and $\frac{7}{8}$ they must have the same name or a *common denominator*. Since the denominators 2 and 8 divide evenly into the denominator 16, 16 is the common denominator.

Change $\frac{1}{2}$ to sixteenths and $\frac{7}{8}$ to sixteenths.

Add. $\frac{8}{16} + \frac{13}{16} + \frac{14}{16} = \frac{35}{16}$

Change the improper fraction $\frac{35}{16}$ to the mixed number $2\frac{3}{16}$.

So Mrs. Black bought, $2\frac{3}{16}$ lb. of turnips.

Add. Each answer must be in lowest terms.

1.	$\frac{1}{2}$	$\frac{5}{6}$	$\frac{2}{3}$	$\frac{1}{4}$	$\frac{7}{10}$	$\frac{2}{3}$	$\frac{11}{16}$	$\frac{5}{12}$
	$\frac{3}{4}$	$\frac{1}{2}$	$\frac{4}{9}$	$\frac{7}{8}$	$\frac{4}{5}$	$\frac{5}{12}$	$\frac{1}{2}$	$\frac{3}{4}$
2.	$\frac{3}{5}$	$\frac{7}{16}$	$\frac{5}{6}$	$\frac{9}{10}$	$\frac{3}{16}$	$\frac{1}{3}$	$\frac{7}{8}$	$\frac{17}{32}$
	$\frac{9}{10}$	$\frac{5}{8}$	$\frac{11}{12}$	$\frac{1}{2}$	$\frac{7}{8}$	$\frac{8}{9}$	$\frac{7}{24}$	$\frac{11}{16}$
3.	$\frac{1}{2}$	$\frac{3}{4}$	$\frac{2}{3}$	$\frac{1}{4}$	$\frac{1}{2}$	$\frac{5}{6}$	$\frac{4}{5}$	$\frac{9}{16}$
	$\frac{1}{4}$	$\frac{2}{3}$	$\frac{1}{2}$	$\frac{5}{16}$	$\frac{7}{10}$	$\frac{1}{3}$	$\frac{3}{4}$	$\frac{1}{4}$
	$\frac{5}{8}$	$\frac{1}{12}$	$\frac{5}{6}$	$\frac{7}{8}$	$\frac{4}{5}$	$\frac{1}{12}$	$\frac{7}{20}$	$\frac{11}{32}$

4. One day last fall there was a heavy rainfall. During the first hour the rainfall was $\frac{1}{4}$ in., during the second hour, $\frac{5}{8}$ in., and during the third hour, $\frac{1}{2}$ in. How many inches of rain fell during the three hours?

ADDING MIXED NUMBERS HAVING UNLIKE FRACTIONS WITH CARRYING

Nancy mailed two parcels of food to friends in Britain. One parcel weighed $5\frac{3}{4}$ lb., and the other $4\frac{7}{16}$ lb. How many pounds did the two parcels weigh?

To find how many pounds the two parcels weighed we *add* $5\frac{3}{4}$ and $4\frac{7}{16}$.

Before we can add $\frac{3}{4}$ and $\frac{7}{16}$ they must have a *common denominator*. The common denominator is 16.

Change $\frac{3}{4}$ to sixteenths. $\frac{3}{4} = \frac{12}{16}$

Add the fractions. $\frac{12}{16} + \frac{7}{16} = \frac{19}{16}$

Change the improper fraction $\frac{19}{16}$ to $1\frac{3}{16}$

Write the $\frac{3}{16}$ under the fractions.

CARRY the whole number 1 and add it to the whole numbers 5 and 4.

$1 + 5 + 4 = 10$. Write the 10 under the whole numbers.

So the two parcels weighed $10\frac{3}{16}$ lb.

$$\begin{array}{r} 5\frac{3}{4} = 5\frac{12}{16} \\ 4\frac{7}{16} = 4\frac{7}{16} \\ \hline 10\frac{3}{16} \end{array}$$

Add. Each answer must be in lowest terms.

1.

$2\frac{1}{2}$	$6\frac{2}{3}$	$4\frac{4}{5}$	$9\frac{7}{10}$	$5\frac{3}{8}$	$8\frac{11}{12}$
$3\frac{3}{4}$	$5\frac{5}{6}$	$8\frac{9}{10}$	$6\frac{1}{2}$	$4\frac{11}{16}$	$7\frac{1}{3}$

2.

$8\frac{1}{3}$	$7\frac{11}{12}$	$4\frac{5}{6}$	$13\frac{9}{16}$	$9\frac{3}{4}$	$15\frac{7}{10}$
$9\frac{7}{9}$	$11\frac{1}{4}$	$9\frac{5}{12}$	$5\frac{1}{2}$	$16\frac{7}{8}$	$7\frac{3}{5}$

3.

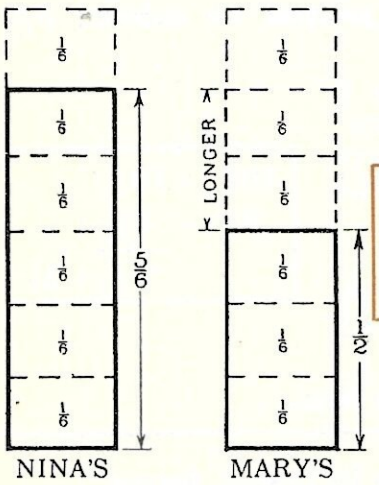
$7\frac{2}{3}$	$2\frac{1}{2}$	$9\frac{3}{8}$	$6\frac{5}{6}$	$9\frac{3}{5}$	$14\frac{1}{2}$
$4\frac{1}{2}$	$6\frac{5}{8}$	$3\frac{1}{4}$	$4\frac{1}{3}$	$13\frac{1}{2}$	$2\frac{7}{12}$
$3\frac{1}{6}$	$5\frac{3}{4}$	$8\frac{7}{16}$	$7\frac{5}{12}$	$11\frac{7}{10}$	$7\frac{2}{3}$

4. Last week Allan studied his geography for $2\frac{1}{3}$ hr., his English for $3\frac{5}{6}$ hr., and his general science for $3\frac{1}{2}$ hr. How many hours did he spend on these studies?

SUBTRACTING UNLIKE FRACTIONS

Nina had a ribbon $\frac{5}{6}$ yd. long. Mary's ribbon was $\frac{1}{2}$ yd. long. How much longer was Nina's ribbon?

To find how much longer Nina's ribbon was we *subtract* $\frac{1}{2}$ from $\frac{5}{6}$.



$\frac{5}{6} = \frac{5}{6}$
$\frac{1}{2} = \frac{3}{6}$
$\frac{2}{6} = \frac{1}{3}$

Before we can subtract $\frac{1}{2}$ from $\frac{5}{6}$ they must have the same name or a *common denominator*.

As the denominator 2 divides evenly into the denominator 6, 6 is the common denominator.

Change $\frac{1}{2}$ to sixths. $\frac{1}{2} = \frac{3}{6}$

Subtract. $\frac{5}{6} - \frac{3}{6} = \frac{2}{6}$

Change $\frac{2}{6}$ to lowest terms. $\frac{2}{6} = \frac{1}{3}$

So Nina's ribbon is $\frac{1}{3}$ yd. longer than Mary's ribbon.

Subtract Each answer must be in lowest terms.

1.

$\frac{1}{2}$	$\frac{1}{2}$	$\frac{2}{5}$	$\frac{3}{8}$	$\frac{3}{4}$	$\frac{9}{10}$	$\frac{5}{12}$	$\frac{1}{2}$
$\frac{1}{4}$	$\frac{1}{6}$	$\frac{1}{10}$	$\frac{1}{4}$	$\frac{1}{16}$	$\frac{1}{2}$	$\frac{1}{4}$	$\frac{3}{16}$

2.

$\frac{5}{6}$	$\frac{7}{10}$	$\frac{7}{8}$	$\frac{3}{4}$	$\frac{2}{3}$	$\frac{1}{2}$	$\frac{7}{12}$	$\frac{11}{16}$
$\frac{1}{12}$	$\frac{3}{5}$	$\frac{3}{16}$	$\frac{5}{12}$	$\frac{5}{9}$	$\frac{3}{10}$	$\frac{1}{2}$	$\frac{1}{4}$

3.

$\frac{3}{4}$	$\frac{9}{16}$	$\frac{7}{9}$	$\frac{13}{16}$	$\frac{5}{6}$	$\frac{7}{8}$	$\frac{2}{3}$	$\frac{5}{8}$
$\frac{5}{8}$	$\frac{1}{2}$	$\frac{2}{3}$	$\frac{1}{4}$	$\frac{2}{3}$	$\frac{3}{4}$	$\frac{5}{12}$	$\frac{5}{16}$

4. Tom picked $\frac{5}{8}$ gal. of blueberries. He gave $\frac{1}{4}$ gal. to a neighbour. How much of a gallon did he have left?

5. Mrs. Brown bought two pork chops. One weighed $\frac{5}{8}$ lb. and the other $\frac{7}{16}$ lb. What was the difference in the weights of the chops?

SUBTRACTING MIXED NUMBERS HAVING UNLIKE FRACTIONS

In the broad jump at the school track meet, Roy jumped $10\frac{2}{3}$ ft. and Sam jumped $8\frac{5}{12}$ ft. How much farther did Roy jump than Sam?

To find how much farther Roy jumped we *subtract* $8\frac{5}{12}$ from $10\frac{2}{3}$.

Before we can subtract $\frac{5}{12}$ from $\frac{2}{3}$ they must have a *common denominator*. Since the denominator 3 divides evenly into the denominator 12; 12 is the common denominator.

Change $\frac{2}{3}$ to twelfths. $\frac{2}{3} = \frac{8}{12}$

Subtract the fractions. $\frac{8}{12} - \frac{5}{12} = \frac{3}{12}$

Subtract the whole numbers. $10 - 8 = 2$

Change $\frac{3}{12}$ to lowest terms. $\frac{3}{12} = \frac{1}{4}$

So Roy jumped $2\frac{1}{4}$ ft. farther than Sam.

$$10\tfrac{2}{3} = 10\tfrac{8}{12}$$
$$8\tfrac{5}{12} = 8\tfrac{5}{12}$$
$$2\tfrac{3}{12} = 2\tfrac{1}{4}$$

Subtract. Each answer must be in lowest terms.

1.

$9\frac{1}{2}$	$7\frac{2}{3}$	$10\frac{4}{5}$	$12\frac{3}{8}$	$13\frac{5}{12}$	$15\frac{7}{8}$
$2\frac{1}{8}$	$5\frac{1}{6}$	$6\frac{3}{10}$	$4\frac{3}{16}$	$7\frac{1}{6}$	$9\frac{1}{2}$

2.

$11\frac{7}{10}$	$16\frac{1}{4}$	$18\frac{1}{2}$	$15\frac{5}{9}$	$14\frac{11}{12}$	$17\frac{5}{16}$
$4\frac{2}{5}$	$7\frac{3}{16}$	$9\frac{5}{12}$	$8\frac{1}{3}$	$9\frac{3}{4}$	$8\frac{1}{8}$

3.

$12\frac{3}{4}$	$15\frac{3}{5}$	$13\frac{7}{12}$	$14\frac{13}{16}$	$19\frac{2}{3}$	$27\frac{7}{8}$
$5\frac{1}{12}$	$6\frac{3}{10}$	$9\frac{1}{6}$	$4\frac{5}{8}$	$12\frac{4}{9}$	$16\frac{7}{16}$

4. Mr. Todd was fixing his steps. He cut a piece $4\frac{1}{2}$ ft. long from a board which was $12\frac{5}{6}$ ft. long. How long was the piece that was left?

5. Jim and Allan belonged to the school Garden Club. At the School Fair, Jim had a pumpkin which weighed $11\frac{9}{16}$ lb., and Allan had one which weighed $9\frac{3}{8}$ lb. How much heavier was Jim's pumpkin?

SUBTRACTING MIXED NUMBERS HAVING UNLIKE FRACTIONS WITH BORROWING

It takes a train $10\frac{1}{3}$ hr. to travel from Sydney to Truro. Mr. Cameron drove his car from Sydney to Truro in $5\frac{5}{6}$ hr. How many hours less did Mr. Cameron take than the train took?

To find how many hours less Mr. Cameron took we *subtract* $5\frac{5}{6}$ from $10\frac{1}{3}$.

$$10\tfrac{1}{3} = 10\tfrac{2}{6} = 9\tfrac{8}{6}$$
$$5\tfrac{5}{6} = 5\tfrac{5}{6} = 5\tfrac{5}{6}$$
$$4\tfrac{3}{6} = 4\tfrac{1}{2}$$

The *common denominator* is 6.
Change $\frac{1}{3}$ to sixths. $\frac{1}{3} = \frac{2}{6}$
We cannot subtract $\frac{5}{6}$ from $\frac{2}{6}$ because $\frac{5}{6}$ is more than $\frac{2}{6}$.
Borrow 1 whole from 10 and change the 1 whole to $\frac{6}{6}$. Add the $\frac{6}{6}$ to $\frac{2}{6}$ making $\frac{8}{6}$.
So $10\frac{2}{6} = 9\frac{8}{6}$
Subtract $\frac{5}{6}$ from $\frac{8}{6}$ leaving $\frac{3}{6}$
Subtract 5 from 9 leaving 4
Change $\frac{3}{6}$ to lowest terms. $\frac{3}{6} = \frac{1}{2}$

So Mr. Cameron took $4\frac{1}{2}$ hr. less.

Subtract. Each answer must be in lowest terms.

1.

$4\frac{1}{6}$	$7\frac{1}{4}$	$6\frac{2}{9}$	$11\frac{3}{4}$	$13\frac{1}{2}$	$14\frac{5}{12}$
$2\frac{1}{2}$	$3\frac{1}{2}$	$1\frac{1}{3}$	$6\frac{7}{8}$	$8\frac{9}{10}$	$4\frac{5}{6}$

2.

$15\frac{3}{16}$	$19\frac{7}{10}$	$19\frac{1}{16}$	$15\frac{1}{12}$	$21\frac{3}{8}$	$32\frac{2}{3}$
$9\frac{1}{4}$	$13\frac{4}{5}$	$8\frac{5}{8}$	$6\frac{5}{6}$	$4\frac{3}{4}$	$17\frac{11}{12}$

3.

$6\frac{1}{2}$	$5\frac{2}{3}$	$3\frac{1}{5}$	$8\frac{5}{6}$	$11\frac{5}{8}$	$10\frac{3}{4}$
$\frac{5}{8}$	$\frac{7}{9}$	$\frac{9}{10}$	$\frac{11}{12}$	$\frac{3}{4}$	$\frac{13}{16}$

4. The Graham baby weighed $19\frac{7}{16}$ lb. a month ago. If the baby weighs $21\frac{1}{4}$ lb. today, how many pounds did the baby gain in the month?

PRACTICE IN ADDITION OF FRACTIONS

Add. All answers must be in lowest terms.

1.

$\frac{3}{8}$	$\frac{2}{7}$	$\frac{5}{9}$	$\frac{7}{10}$	$\frac{11}{12}$	$\frac{9}{16}$
$\frac{3}{8}$	$\frac{3}{7}$	$\frac{1}{9}$	$\frac{9}{10}$	$\frac{7}{12}$	$\frac{11}{16}$

2.

$4\frac{1}{6}$	$6\frac{3}{10}$	$9\frac{3}{5}$	$3\frac{3}{16}$	$9\frac{5}{12}$	$11\frac{1}{4}$
$2\frac{1}{6}$	$3\frac{1}{10}$	$5\frac{1}{5}$	$8\frac{5}{16}$	$7\frac{1}{12}$	$2\frac{1}{4}$

3.

$2\frac{3}{8}$	$4\frac{7}{9}$	$6\frac{5}{12}$	$7\frac{3}{4}$	$5\frac{9}{10}$	$12\frac{7}{16}$
$1\frac{7}{8}$	$8\frac{5}{9}$	$9\frac{7}{12}$	$7\frac{3}{4}$	$8\frac{3}{10}$	$2\frac{13}{16}$

4.

$\frac{1}{2}$	$\frac{1}{3}$	$\frac{3}{5}$	$\frac{2}{3}$	$\frac{1}{6}$	$\frac{3}{8}$
$\frac{1}{8}$	$\frac{1}{6}$	$\frac{3}{10}$	$\frac{1}{9}$	$\frac{7}{12}$	$\frac{1}{16}$

5.

$\frac{1}{6}$	$\frac{5}{8}$	$\frac{2}{3}$	$\frac{3}{4}$	$\frac{7}{8}$	$\frac{7}{16}$
$\frac{11}{12}$	$\frac{1}{2}$	$\frac{8}{9}$	$\frac{5}{16}$	$\frac{15}{16}$	$\frac{29}{32}$

6.

$4\frac{7}{8}$	$1\frac{2}{5}$	$7\frac{13}{16}$	$8\frac{3}{4}$	$3\frac{2}{3}$	$6\frac{1}{2}$
$5\frac{1}{2}$	$6\frac{7}{10}$	$4\frac{5}{8}$	$2\frac{7}{12}$	$9\frac{5}{9}$	$8\frac{15}{16}$

7.

$8\frac{11}{12}$	$13\frac{3}{4}$	$7\frac{9}{10}$	$10\frac{7}{8}$	$12\frac{1}{3}$	$17\frac{11}{12}$
$7\frac{2}{3}$	$4\frac{5}{8}$	$9\frac{1}{2}$	$5\frac{9}{16}$	$4\frac{5}{6}$	$5\frac{3}{4}$

8.

$\frac{1}{10}$	$\frac{3}{8}$ $\frac{2}{15}$	$\frac{3}{4}$	$\frac{5}{16}$	$\frac{7}{8}$ $\frac{2}{3}$	$\frac{11}{12}$
$\frac{3}{10}$	$\frac{1}{8}$ $\frac{7}{15}$	$\frac{1}{4}$	$\frac{9}{16}$	$\frac{5}{8}$ $\frac{2}{3}$	$\frac{7}{12}$
$\frac{1}{10}$	$\frac{3}{8}$ $\frac{4}{15}$	$\frac{3}{4}$	$\frac{15}{16}$	$\frac{7}{8}$ $\frac{2}{3}$	$\frac{6}{12}$

9.

$4\frac{1}{9}$	$6\frac{5}{16}$	$5\frac{1}{2}$	$7\frac{2}{3}$	$8\frac{3}{4}$	$11\frac{7}{10}$
$3\frac{4}{9}$	$4\frac{3}{16}$	$8\frac{7}{8}$	$2\frac{9}{12}$	$\frac{5}{8}$	$4\frac{1}{2}$
$2\frac{2}{9}$	$3\frac{7}{16}$	$6\frac{5}{8}$	$9\frac{5}{6}$	$9\frac{7}{16}$	$\frac{4}{5}$

PRACTICE IN SUBTRACTION OF FRACTIONS

Subtract. All answers must be in lowest terms.

1.	$\frac{7}{8}$ $\frac{3}{8}$	$\frac{5}{6}$ $\frac{1}{6}$	$\frac{7}{12}$ $\frac{3}{12}$	$8\frac{3}{5}$ $2\frac{1}{5}$	$9\frac{11}{16}$ $4\frac{5}{16}$	$6\frac{17}{20}$ $6\frac{3}{20}$
2.	5 $\frac{1}{3}$	7 $\frac{5}{6}$	4 $\frac{9}{10}$	$3\frac{1}{4}$ $\frac{3}{4}$	$6\frac{5}{8}$ $\frac{7}{8}$	$7\frac{5}{16}$ $\frac{9}{16}$
3.	9 $7\frac{4}{5}$	11 $8\frac{7}{12}$	14 $3\frac{5}{7}$	$4\frac{1}{6}$ $\frac{5}{6}$	$10\frac{7}{12}$ $\frac{11}{12}$	$8\frac{5}{9}$ $\frac{8}{9}$
4.	$8\frac{1}{3}$ $4\frac{2}{3}$	$10\frac{2}{5}$ $6\frac{4}{5}$	$15\frac{3}{10}$ $3\frac{9}{10}$	$19\frac{7}{16}$ $12\frac{11}{16}$	$25\frac{1}{12}$ $16\frac{5}{12}$	$13\frac{7}{20}$ $7\frac{13}{20}$
5.	$\frac{1}{2}$ $\frac{3}{8}$	$\frac{7}{12}$ $\frac{1}{4}$	$\frac{5}{8}$ $\frac{3}{16}$	$\frac{3}{4}$ $\frac{7}{12}$	$\frac{9}{10}$ $\frac{3}{5}$	$\frac{11}{12}$ $\frac{5}{6}$
6.	$\frac{3}{4}$ $\frac{1}{2}$	$\frac{2}{3}$ $\frac{2}{9}$	$\frac{3}{4}$ $\frac{3}{8}$	$\frac{4}{5}$ $\frac{7}{10}$	$\frac{13}{16}$ $\frac{1}{2}$	$\frac{3}{8}$ $\frac{5}{16}$
7.	$9\frac{1}{3}$ $6\frac{1}{12}$	$7\frac{2}{5}$ $2\frac{3}{10}$	$15\frac{7}{8}$ $9\frac{5}{16}$	$16\frac{7}{10}$ $6\frac{1}{2}$	$12\frac{5}{6}$ $8\frac{7}{12}$	$23\frac{1}{8}$ $14\frac{1}{16}$
8.	$6\frac{1}{8}$ $3\frac{1}{2}$	$9\frac{2}{9}$ $4\frac{2}{3}$	$7\frac{3}{10}$ $1\frac{3}{5}$	$10\frac{1}{3}$ $5\frac{7}{12}$	$13\frac{1}{4}$ $2\frac{7}{8}$	$17\frac{5}{12}$ $8\frac{2}{3}$
9.	$8\frac{1}{6}$ $6\frac{5}{12}$	$5\frac{5}{8}$ $3\frac{3}{4}$	$14\frac{3}{10}$ $7\frac{4}{5}$	$19\frac{2}{3}$ $6\frac{5}{6}$	$21\frac{3}{16}$ $12\frac{7}{8}$	$35\frac{3}{4}$ $17\frac{15}{16}$
10.	$5\frac{7}{12}$ $\frac{3}{4}$	$3\frac{5}{16}$ $\frac{1}{2}$	$7\frac{1}{8}$ $\frac{3}{4}$	$9\frac{3}{4}$ $\frac{11}{12}$	$11\frac{4}{5}$ $\frac{9}{10}$	$13\frac{3}{16}$ $\frac{5}{8}$

PROBLEMS USING FRACTIONS

1. Sam and his friends had been on a hike. Sam invited his friends to his home for a lunch of milk and cookies. In the ice-box he found two bottles of milk. There was $\frac{5}{8}$ qt. in one bottle and $\frac{3}{4}$ qt. in the other. How much milk was there altogether?

2. Bob and Toby went fishing. The first trout Bob caught weighed $\frac{13}{16}$ lb., and the first one Toby caught weighed $\frac{5}{8}$ lb. How much more did Bob's fish weigh than Toby's?

3. Roy's father is $5\frac{11}{12}$ ft. tall and Roy is $4\frac{1}{2}$ ft. tall. How much taller is Roy's father than Roy?

4. Mrs. Collins bought $4\frac{7}{12}$ yd. of curtain material for her dining-room, and $5\frac{5}{6}$ yd. for her living-room. How many yards of curtain material did she buy?

5. Mary was going to give a solo on the piano at the school concert. On Monday she practised $1\frac{1}{2}$ hr.; on Tuesday, $1\frac{1}{3}$ hr.; and on Wednesday, $1\frac{5}{6}$ hr. How many hours did she practise altogether?

6. When Sally went to the girls' camp last summer she weighed $67\frac{1}{2}$ lb. When she returned home she weighed $72\frac{1}{4}$ lb. How many pounds did Sally gain while at camp?

7. Bill's father was sick two days last week. He gave his car to Bill to do some errands for him. The first day Bill drove the car $31\frac{7}{10}$ mi., and the second day, he drove $43\frac{4}{5}$ mi. How many miles did Bill drive?

8. Mr. Jackson bought $12\frac{1}{2}$ tons of coal last fall. In the spring there was $\frac{3}{4}$ of a ton left. How many tons of coal did Mr. Jackson use during the winter?

9. The distance from Lowtown to Hightown is $5\frac{1}{2}$ mi. Bytown is $3\frac{3}{4}$ mi. farther, and it is $6\frac{5}{8}$ mi. farther still to Uptown. How far is it from Lowtown to Uptown?

KEEPING THE TOOLS SHARP

Add. Check each answer.

1.	6964	9207	5974	8205	5867
	5394	4075	7568	6079	4706
	4753	3126	2667	5353	8568
	3530	7094	8483	2109	5364
	1752	8974	6970	5086	7989
	6907	5052	2351	7114	9018
2.	9735	8487	6532	5499	75
	5583	4975	769	737	7248
	6646	7353	5344	85	785
	4377	5698	3459	8246	48
	8785	3766	568	57	4632
	7479	4754	2629	4936	2397

Subtract. Check each answer.

3.	1525	1370	1400	6000	3000
	947	581	817	2764	2876
4.	5000	8419	6775	5106	7042
	347	3854	4849	1059	2306

5.	71969	58453	83664	28517
	18496	32725	59278	24675
6.	96227	73736	16270	13304
	20679	35776	6388	4859
7.	45245	23040	40208	60402
	25968	19346	30209	50703
8.	34230	50631	75325	20178
	27576	18758	65836	19379

KEEPING THE TOOLS SHARP

Multiply. Check each answer.

1.	$\begin{array}{r} 813 \\ \times\ 7 \\ \hline \end{array}$	$\begin{array}{r} 609 \\ \times\ 4 \\ \hline \end{array}$	$\begin{array}{r} 571 \\ \times\ 6 \\ \hline \end{array}$	$\begin{array}{r} 480 \\ \times\ 9 \\ \hline \end{array}$	$\begin{array}{r} 805 \\ \times\ 8 \\ \hline \end{array}$
2.	$\begin{array}{r} 354 \\ \times\ 3 \\ \hline \end{array}$	$\begin{array}{r} 758 \\ \times\ 8 \\ \hline \end{array}$	$\begin{array}{r} 269 \\ \times\ 7 \\ \hline \end{array}$	$\begin{array}{r} 384 \\ \times\ 6 \\ \hline \end{array}$	$\begin{array}{r} 639 \\ \times\ 9 \\ \hline \end{array}$
3.	$\begin{array}{r} 2356 \\ \times\ 5 \\ \hline \end{array}$	$\begin{array}{r} 8473 \\ \times\ 4 \\ \hline \end{array}$	$\begin{array}{r} 3627 \\ \times\ 8 \\ \hline \end{array}$	$\begin{array}{r} 4195 \\ \times\ 7 \\ \hline \end{array}$	$\begin{array}{r} 2956 \\ \times\ 6 \\ \hline \end{array}$
4.	$\begin{array}{r} 87 \\ \times\ 70 \\ \hline \end{array}$	$\begin{array}{r} 94 \\ \times\ 64 \\ \hline \end{array}$	$\begin{array}{r} 253 \\ \times\ 39 \\ \hline \end{array}$	$\begin{array}{r} 809 \\ \times\ 52 \\ \hline \end{array}$	$\begin{array}{r} 904 \\ \times\ 87 \\ \hline \end{array}$
5.	$\begin{array}{r} 632 \\ \times\ 400 \\ \hline \end{array}$	$\begin{array}{r} 748 \\ \times\ 390 \\ \hline \end{array}$	$\begin{array}{r} 915 \\ \times\ 506 \\ \hline \end{array}$	$\begin{array}{r} 356 \\ \times\ 172 \\ \hline \end{array}$	$\begin{array}{r} 829 \\ \times\ 683 \\ \hline \end{array}$
6.	$\begin{array}{r} \$1.24 \\ \times\ 7 \\ \hline \end{array}$	$\begin{array}{r} \$5.06 \\ \times\ 3 \\ \hline \end{array}$	$\begin{array}{r} \$2.87 \\ \times\ 5 \\ \hline \end{array}$	$\begin{array}{r} \$4.75 \\ \times\ 8 \\ \hline \end{array}$	$\begin{array}{r} \$3.56 \\ \times\ 9 \\ \hline \end{array}$
7.	$\begin{array}{r} \$\ .42 \\ \times\ 15 \\ \hline \end{array}$	$\begin{array}{r} \$\ .63 \\ \times\ 46 \\ \hline \end{array}$	$\begin{array}{r} \$1.74 \\ \times\ 39 \\ \hline \end{array}$	$\begin{array}{r} \$3.58 \\ \times\ 67 \\ \hline \end{array}$	$\begin{array}{r} \$2.78 \\ \times\ 98 \\ \hline \end{array}$

Divide. Check each answer.

8.	$52\overline{)1872}$	$29\overline{)1257}$	$68\overline{)3896}$	$25\overline{)1585}$
9.	$74\overline{)3608}$	$42\overline{)1207}$	$16\overline{)1574}$	$18\overline{)1374}$
10.	$15\overline{)1305}$	$34\overline{)3374}$	$73\overline{)7056}$	$33\overline{)3249}$
11.	$24\overline{)9984}$	$63\overline{)36813}$	$49\overline{)20507}$	$87\overline{)30124}$
12.	$93\overline{)39990}$	$17\overline{)10722}$	$39\overline{)11310}$	$58\overline{)42945}$
13.	$72\overline{)29354}$	$55\overline{)11495}$	$14\overline{)11298}$	$79\overline{)63928}$

FINDING A COMMON DENOMINATOR

Only fractions which have a *common denominator* can be added or subtracted.

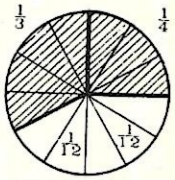
Add	$\frac{3}{4} = \frac{6}{8}$ $\frac{5}{8} = \frac{5}{8}$ $\frac{11}{8} = 1\frac{3}{8}$	The common denominator of the unlike fractions is the denominator of one of the fractions.

When we added $\frac{3}{4}$ and $\frac{5}{8}$ we saw that the denominator 4 divided evenly into the denominator 8, so we used 8 as the common denominator, and changed $\frac{3}{4}$ to $\frac{6}{8}$.

Now let us add $\frac{1}{3}$ and $\frac{1}{4}$. First we must find a *common denominator*. We cannot change $\frac{1}{3}$ to fourths, or $\frac{1}{4}$ to thirds. So the common denominator of $\frac{1}{3}$ and $\frac{1}{4}$ *is not* the denominator of one of the fractions.

Let us find a common denominator for $\frac{1}{3}$ and $\frac{1}{4}$.

The circle below is divided into twelfths. Notice that $\frac{1}{3} = \frac{4}{12}$ and that $\frac{1}{4} = \frac{3}{12}$. So $\frac{1}{3}$ and $\frac{1}{4}$ can be changed to the common denominator *twelfths*. We see from the figure that $\frac{1}{4} + \frac{1}{3} = \frac{7}{12}$. *Notice that the common denominator, 12, is the product of 3 and 4.*



Add.	$\frac{1}{3} = \frac{4}{12}$ $\frac{1}{4} = \frac{3}{12}$ $\frac{7}{12}$	The common denominator of the unlike fractions is the *product* of their denominators.

When no number except 1 will divide into both denominators, the common denominator of unlike fractions is the product of the denominator of the fractions.

1. What common denominator would you use if you were adding $\frac{1}{2}$ and $\frac{2}{5}$? $\frac{2}{3}$ and $\frac{1}{8}$? $\frac{3}{4}$ and $\frac{3}{5}$?

2. What common denominator would you use if you were subtracting $\frac{1}{2}$ and $\frac{1}{3}$? $\frac{1}{5}$ and $\frac{2}{3}$? $\frac{5}{6}$ and $\frac{4}{5}$?

ADDING FRACTIONS AND MIXED NUMBERS WHEN THE FRACTIONS ARE UNLIKE

George went on a two-mile hike. He walked the first mile in $16\frac{3}{4}$ min. and the second mile in $18\frac{2}{5}$ min. How long did it take him to walk the two miles?

To find how long it took George to walk the two miles we *add* $16\frac{3}{4}$ and $18\frac{2}{5}$

$16\frac{3}{4} = 16\frac{15}{20}$
$18\frac{2}{5} = 18\frac{8}{20}$
$35\frac{3}{20}$

Since no number except 1 divides evenly into the denominators 4 and 5, the common denominator is $4 \times 5 = 20$.
Change $\frac{3}{4}$ to $\frac{15}{20}$ and $\frac{2}{5}$ to $\frac{8}{20}$
Add the fractions. $\frac{15}{20} + \frac{8}{20} = \frac{23}{20}$
Change $\frac{23}{20}$ to $1\frac{3}{20}$
Write the $\frac{3}{20}$ under the fractions.
Carry the 1 and add it to the whole numbers.
So it took George $35\frac{3}{20}$ min. to walk the two miles.

Add. Each answer must be in lowest terms.

1.

$\frac{1}{2}$	$\frac{3}{4}$	$\frac{1}{3}$	$\frac{2}{5}$	$\frac{4}{5}$	$\frac{2}{3}$	$\frac{1}{5}$	$\frac{2}{7}$
$\frac{2}{3}$	$\frac{1}{3}$	$\frac{1}{5}$	$\frac{1}{4}$	$\frac{1}{2}$	$\frac{4}{5}$	$\frac{3}{8}$	$\frac{1}{2}$

2.

$7\frac{2}{5}$	$8\frac{1}{2}$	$5\frac{2}{3}$	$10\frac{1}{6}$	$15\frac{1}{10}$	$17\frac{2}{5}$
$2\frac{1}{3}$	$6\frac{1}{3}$	$9\frac{1}{4}$	$3\frac{1}{5}$	$2\frac{2}{3}$	$16\frac{1}{2}$

3.

$2\frac{2}{3}$	$5\frac{1}{2}$	$9\frac{4}{5}$	$4\frac{1}{3}$	$3\frac{3}{10}$	$10\frac{2}{5}$
$4\frac{3}{4}$	$6\frac{3}{5}$	$8\frac{1}{4}$	$7\frac{7}{8}$	$1\frac{2}{3}$	$4\frac{5}{6}$

4.

$9\frac{1}{3}$	$11\frac{2}{5}$	$14\frac{2}{3}$	$21\frac{3}{4}$	$15\frac{2}{3}$	$32\frac{3}{5}$
$8\frac{4}{5}$	$6\frac{1}{2}$	$5\frac{7}{10}$	$4\frac{1}{5}$	$19\frac{5}{8}$	$21\frac{1}{6}$

5.

$12\frac{2}{5}$	$8\frac{1}{3}$	$19\frac{4}{5}$	$45\frac{1}{6}$	$36\frac{3}{8}$	$29\frac{2}{3}$
$4\frac{1}{2}$	$16\frac{3}{8}$	$6\frac{3}{4}$	$23\frac{1}{5}$	$17\frac{2}{3}$	$10\frac{7}{10}$

6. Tony and George made a fishing raft by nailing two old doors to poles. If one door was $3\frac{2}{3}$ ft. wide and the other, $4\frac{1}{4}$ ft. wide, how wide was the raft?

SUBTRACTING FRACTIONS AND MIXED NUMBERS WHEN THE FRACTIONS ARE UNLIKE

Mrs. Charles was cooking for the church fair. She used $4\frac{1}{3}$ cups of flour for biscuits and $2\frac{1}{2}$ cups of flour for pies. How many more cups of flour did she use for the biscuits than for the pies?

To find out how many more cups of flour she used for the biscuits than for the pies, we *subtract* $2\frac{1}{2}$ from $4\frac{1}{3}$.

Since no number except 1 divides evenly into the denominators 3 and 2, the common denominator is $3 \times 2 = 6$.

Change $\frac{1}{3}$ to $\frac{2}{6}$ and $\frac{1}{2}$ to $\frac{3}{6}$.

We cannot subtract $\frac{3}{6}$ from $\frac{2}{6}$.

Borrow 1 whole from 4 and change it to $\frac{6}{6}$.

So $4\frac{2}{6} = 3\frac{8}{6}$.

Subtract the fractions. $\frac{8}{6} - \frac{3}{6} = \frac{5}{6}$.

Subtract the whole number. $3 - 2 = 1$

So she used $1\frac{5}{6}$ cups more for the biscuits.

$$4\tfrac{1}{3} = 4\tfrac{2}{6} = 3\tfrac{8}{6}$$
$$2\tfrac{1}{2} = 2\tfrac{3}{6} = 2\tfrac{3}{6}$$
$$1\tfrac{5}{6}$$

Subtract. Each answer must be in lowest terms.

1.

$\frac{1}{2}$	$\frac{2}{3}$	$\frac{3}{4}$	$\frac{2}{3}$	$\frac{1}{3}$	$\frac{3}{4}$	$\frac{4}{5}$	$\frac{3}{8}$
$\frac{1}{3}$	$\frac{1}{2}$	$\frac{1}{3}$	$\frac{1}{5}$	$\frac{1}{10}$	$\frac{2}{5}$	$\frac{2}{3}$	$\frac{1}{3}$

2.

$5\frac{2}{3}$	$8\frac{2}{5}$	$9\frac{3}{4}$	$11\frac{4}{5}$	$13\frac{1}{2}$	$16\frac{7}{8}$
$3\frac{1}{4}$	$4\frac{1}{3}$	$6\frac{3}{5}$	$2\frac{1}{6}$	$8\frac{2}{5}$	$9\frac{2}{3}$

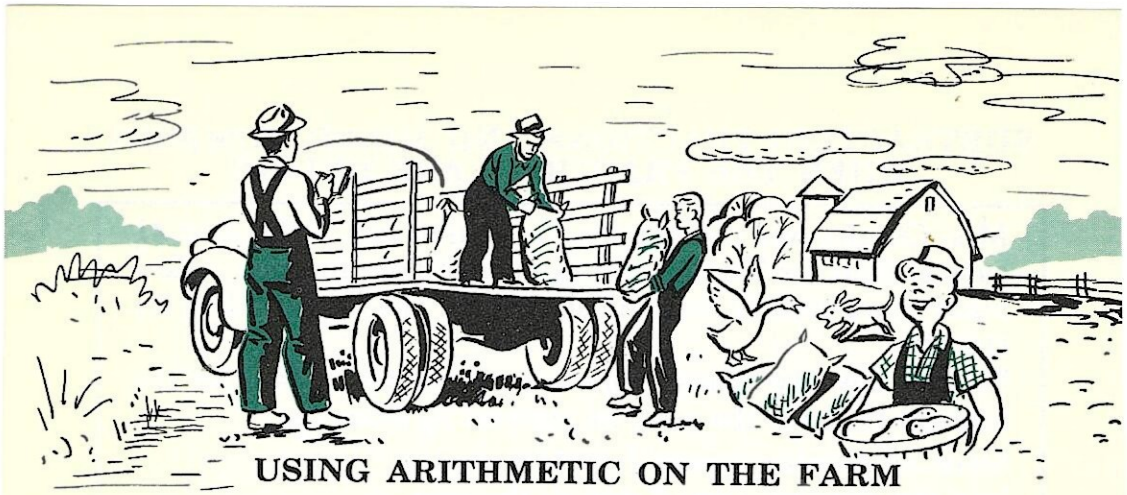
3.

$7\frac{1}{2}$	$6\frac{1}{4}$	$12\frac{1}{3}$	$15\frac{1}{2}$	$13\frac{3}{10}$	$14\frac{2}{5}$
$1\frac{2}{3}$	$2\frac{1}{3}$	$8\frac{4}{5}$	$6\frac{7}{10}$	$4\frac{2}{3}$	$7\frac{5}{6}$

4.

$8\frac{1}{2}$	$9\frac{1}{5}$	$13\frac{1}{2}$	$17\frac{3}{8}$	$26\frac{1}{3}$	$32\frac{1}{5}$
$6\frac{1}{7}$	$4\frac{1}{3}$	$8\frac{2}{5}$	$7\frac{2}{3}$	$14\frac{1}{4}$	$27\frac{5}{8}$

5. Ellen told her teacher that her mother had just finished hooking a mat. The teacher asked Ellen how large the mat was. That day Ellen measured it and found it was $7\frac{1}{4}$ ft. long and $4\frac{2}{3}$ ft. wide. How much longer was the mat than it was wide?



USING ARITHMETIC ON THE FARM

Every farmer should be good at arithmetic. Here are some problems he should be able to do.

1. Mr. Rankin owns a large farm on which he does mixed farming. Last year he grew 7440 lb. of potatoes. How many bushels did he grow if a bushel of potatoes weighs 60 lb.?

2. He sold 93 bu. of these potatoes at $1.28 a bu. How much did he get for the potatoes?

3. Last spring he sowed 4 acres of his farm in oats. If he got an average of 29 bu. to the acre, how many bushels of oats did he have?

4. In the fall he killed 6 pigs and shipped them to the market. If the total weight of the pigs was 942 lb., what was the average weight of the pigs?

5. The Rankins keep hens too. Last month they sold 36 dozen eggs at $ .57 a dozen. How much did they get for the eggs?

6. One of Mr. Rankin's best cows gives 5 gallons of milk a day. How many quarts does she give a day?

7. Last night Mr. Rankin bought 3 hay forks at $1.19 each. How much change did he get from $5.00?

8. He also needed a new tractor. He bought one worth $1800. If he paid for the tractor in 24 equal payments, how much did he pay each time?

FINDING THE LEAST COMMON DENOMINATOR

Only fractions which have a common denominator can be added or subtracted.

We should always use the *least common denominator*, that is, the smallest denominator into which each of the denominators divides evenly.

I. When adding or subtracting the unlike fractions $\frac{3}{4}$ from $\frac{5}{8}$ we see that the denominator 4 divides evenly into the denominator 8. So *8 is the least common denominator* because it is the smallest number into which both 4 and 8 divide evenly.

II. When adding or subtracting the unlike fractions $\frac{2}{3}$ and $\frac{1}{4}$, in which no number except 1 will divide into both denominators, we can find a common denominator by multiplying the denominators, $3 \times 4 = 12$. The *least common denominator* of $\frac{2}{3}$ and $\frac{1}{4}$ is *12* because 12 is the smallest number into which both 3 and 4 divide evenly.

III. Suppose we want to add or subtract the unlike fractions $\frac{5}{6}$ and $\frac{3}{8}$. The common denominator is not 8 because the denominator 6 does not divide evenly into 8.

Multiply the denominators. $6 \times 8 = 48$. A common denominator of $\frac{5}{6}$ and $\frac{3}{8}$ is 48, but it is *NOT* the least common denominator, because both 6 and 8 will both divide evenly into 24, which is a smaller number than 48.

Here is an easy way to find the least common denominator of $\frac{5}{6}$ and $\frac{3}{8}$.

(1) Take the larger (or largest) denominator, 8.

(2) Multiply 8 by 2. $2 \times 8 = 16$. But 6 does not divide evenly into 16.

Try, $3 \times 8 = 24$. Both 6 and 8 divide evenly into 24 so the *least common denominator* of $\frac{5}{6}$ and $\frac{3}{8}$ is 24.

If 24 would not work, you should try $4 \times 8 = 32$, and so on, until you find the least common denominator.

1. Find the least common denominator of $\frac{3}{4}$ and $\frac{1}{6}$; of $\frac{7}{10}$ and $\frac{1}{4}$; of $\frac{5}{6}$ and $\frac{1}{9}$, of $\frac{3}{8}$ and $\frac{1}{10}$; of $\frac{1}{12}$ and $\frac{1}{10}$.

2. Which is the larger, $\frac{5}{6}$ or $\frac{7}{8}$; $\frac{3}{4}$ or $\frac{7}{10}$; $\frac{7}{12}$ or $\frac{5}{8}$?

ADDING FRACTIONS AND MIXED NUMBERS WHEN THE FRACTIONS ARE UNLIKE

Frank likes to know just how long it takes him to do every job he does, so he keeps track of his time. On Saturday he took $2\frac{3}{10}$ hr. to mow the lawn, and $3\frac{5}{6}$ hr. to clean the cellar. How many hours did he take to do the two jobs?

To find how many hours he took we *add* $2\frac{3}{10}$ and $3\frac{5}{6}$.

$$2\tfrac{3}{10} = 2\tfrac{9}{30}$$
$$3\tfrac{5}{6} = 3\tfrac{25}{30}$$
$$6\tfrac{4}{30} = 6\tfrac{2}{15}$$

Find the least common denominator. Multiply the larger denominator, 10, by 2. $2 \times 10 = 20$. But 6 does not divide evenly into 20. Multiply 10 by 3. $3 \times 10 = 30$. 6 divides evenly into 30, so *30 is the least common denominator.*

Change $\frac{3}{10}$ to $\frac{9}{30}$ and $\frac{5}{6}$ to $\frac{25}{30}$.

Add the fractions. $\frac{9}{30} + \frac{25}{30} = \frac{34}{30}$

Change $\frac{34}{30}$ to $1\frac{4}{30}$. Write the $\frac{4}{30}$

Carry the 1 and add to the whole numbers. Change $\frac{4}{30}$ to $\frac{2}{15}$

So it took Frank $6\frac{2}{15}$ hr. to do the two jobs.

Add. Each answer must be in lowest terms.

1.

$\frac{1}{4}$	$\frac{3}{4}$	$\frac{5}{6}$	$\frac{4}{9}$	$\frac{3}{8}$	$\frac{5}{6}$	$\frac{1}{6}$	$\frac{5}{8}$
$\frac{1}{6}$	$\frac{1}{10}$	$\frac{1}{8}$	$\frac{1}{6}$	$\frac{3}{10}$	$\frac{2}{9}$	$\frac{3}{10}$	$\frac{5}{12}$

2.

$5\frac{1}{4}$	$4\frac{1}{6}$	$6\frac{3}{8}$	$9\frac{1}{12}$	$8\frac{3}{10}$	$7\frac{4}{9}$
$2\frac{1}{10}$	$1\frac{2}{9}$	$7\frac{1}{6}$	$3\frac{1}{8}$	$5\frac{1}{8}$	$3\frac{1}{12}$

3.

$2\frac{5}{6}$	$5\frac{3}{8}$	$7\frac{8}{9}$	$16\frac{7}{10}$	$23\frac{1}{6}$	$31\frac{5}{6}$
$8\frac{1}{4}$	$4\frac{9}{10}$	$9\frac{1}{6}$	$6\frac{3}{4}$	$23\frac{7}{8}$	$5\frac{9}{10}$

4.

$11\frac{7}{10}$	$8\frac{5}{6}$	$14\frac{11}{15}$	$25\frac{7}{9}$	$15\frac{9}{10}$	$23\frac{7}{12}$
$4\frac{5}{6}$	$15\frac{5}{8}$	$9\frac{7}{10}$	$6\frac{5}{6}$	$12\frac{7}{8}$	$19\frac{5}{8}$

5. Fred worked in a tourist canteen during his holidays. One busy day he sold $9\frac{3}{4}$ doz. ham sandwiches and $7\frac{5}{6}$ doz. cheese sandwiches. How many dozen sandwiches did he sell that day?

SUBTRACTING FRACTIONS AND MIXED NUMBERS WHEN THE FRACTIONS ARE UNLIKE

At the school track meet Roy ran the 100 yd. dash in $12\frac{7}{10}$ sec., and Steve ran the same distance in $14\frac{1}{4}$ sec. How much longer did it take Steve to run 100 yd. than Roy?

To find how much longer it took Steve we *subtract* $12\frac{7}{10}$ from $14\frac{1}{4}$.

Find the least common denominator.

Multiply the larger denominator, 10 by 2. $2 \times 10 = 20$. 4 divides evenly into 20, so *20 is the least common denominator.*

Change $\frac{1}{4}$ to $\frac{5}{20}$ and $\frac{7}{10}$ to $\frac{14}{20}$.

We cannot subtract $\frac{14}{20}$ from $\frac{5}{20}$

Borrow 1 whole from 14 and change it to $\frac{20}{20}$. So $14\frac{5}{20} = 13\frac{25}{20}$

Subtract the fractions. Subtract the whole numbers.

So it took Steve $1\frac{11}{20}$ sec. longer than Roy.

$$14\tfrac{1}{4} = 14\tfrac{5}{20} = 13\tfrac{25}{20}$$
$$12\tfrac{7}{10} = 12\tfrac{14}{20} = 12\tfrac{14}{20}$$
$$1\tfrac{11}{20}$$

Subtract. Each answer must be in lowest terms.

1.

$\frac{5}{6}$	$\frac{3}{8}$	$\frac{3}{4}$	$\frac{5}{8}$	$\frac{5}{6}$	$\frac{9}{10}$	$\frac{7}{8}$	$\frac{1}{6}$
$\frac{1}{4}$	$\frac{1}{12}$	$\frac{3}{10}$	$\frac{1}{6}$	$\frac{2}{9}$	$\frac{5}{6}$	$\frac{7}{10}$	$\frac{1}{15}$

2.

$4\frac{5}{6}$	$6\frac{1}{8}$	$9\frac{8}{9}$	$7\frac{5}{8}$	$8\frac{1}{4}$	$5\frac{5}{6}$
$1\frac{3}{8}$	$3\frac{1}{12}$	$5\frac{1}{6}$	$2\frac{3}{10}$	$4\frac{1}{10}$	$2\frac{7}{10}$

3.

$7\frac{1}{6}$	$4\frac{3}{8}$	$8\frac{3}{10}$	$6\frac{1}{10}$	$3\frac{1}{6}$	$9\frac{3}{4}$
$3\frac{3}{8}$	$1\frac{7}{10}$	$6\frac{5}{6}$	$2\frac{5}{12}$	$1\frac{7}{9}$	$7\frac{9}{10}$

4.

$8\frac{1}{6}$	$11\frac{5}{6}$	$17\frac{1}{8}$	$13\frac{2}{9}$	$15\frac{3}{10}$	$14\frac{3}{8}$
$2\frac{3}{4}$	$4\frac{9}{10}$	$9\frac{5}{12}$	$6\frac{5}{6}$	$7\frac{7}{8}$	$5\frac{5}{6}$

5.

$12\frac{5}{6}$	$10\frac{1}{8}$	$16\frac{3}{4}$	$21\frac{1}{10}$	$19\frac{1}{6}$	$32\frac{5}{12}$
$6\frac{2}{9}$	$2\frac{3}{10}$	$7\frac{5}{6}$	$15\frac{1}{4}$	$13\frac{3}{8}$	$26\frac{5}{8}$

6. There are 2 wells on Mr. Graham's farm. One well is $18\frac{5}{6}$ ft. deep and the other is $21\frac{1}{4}$ ft. deep. How much deeper is the second well?

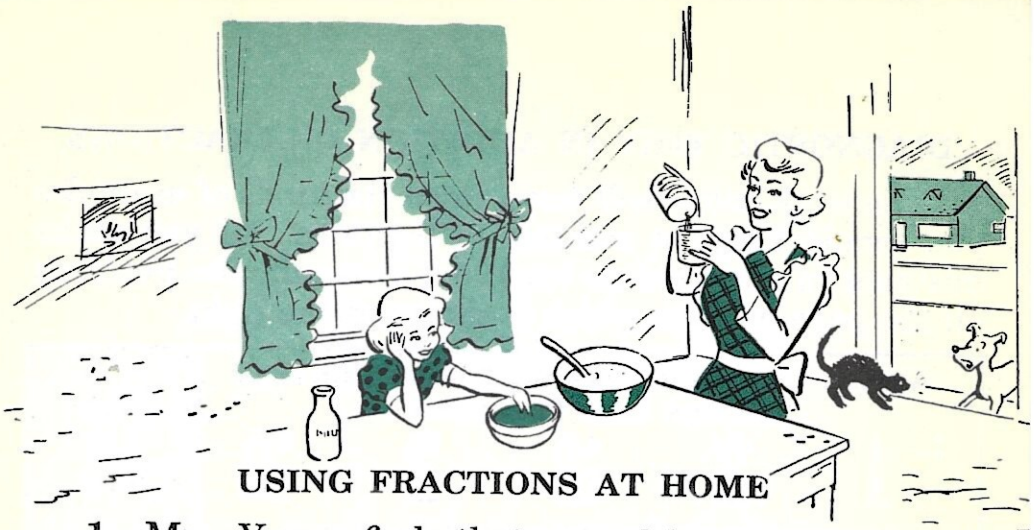
PRACTICE IN ADDITION AND SUBTRACTION OF FRACTIONS WITH UNLIKE DENOMINATORS

Add. Each answer must be in lowest terms.

1.	$\frac{1}{8}$	$\frac{1}{5}$	$\frac{1}{6}$	$\frac{3}{10}$	$\frac{3}{5}$	$\frac{2}{3}$
	$\frac{1}{4}$	$\frac{1}{2}$	$\frac{1}{8}$	$\frac{1}{4}$	$\frac{1}{6}$	$\frac{1}{12}$
2.	$\frac{2}{3}$	$\frac{5}{6}$	$\frac{5}{8}$	$\frac{3}{4}$	$\frac{3}{10}$	$\frac{11}{12}$
	$\frac{2}{5}$	$\frac{3}{4}$	$\frac{11}{16}$	$\frac{4}{5}$	$\frac{5}{6}$	$\frac{5}{8}$
3.	$2\frac{1}{4}$	$8\frac{5}{16}$	$9\frac{3}{10}$	$7\frac{1}{3}$	$4\frac{1}{9}$	$5\frac{1}{10}$
	$7\frac{1}{5}$	$3\frac{1}{8}$	$5\frac{1}{4}$	$6\frac{1}{10}$	$9\frac{1}{12}$	$8\frac{3}{5}$
4.	$6\frac{5}{6}$	$11\frac{2}{3}$	$13\frac{3}{5}$	$12\frac{2}{3}$	$16\frac{5}{12}$	$32\frac{4}{5}$
	$8\frac{3}{10}$	$3\frac{7}{12}$	$8\frac{3}{4}$	$5\frac{9}{10}$	$7\frac{3}{8}$	$8\frac{3}{10}$
5.	$10\frac{3}{8}$	$9\frac{2}{3}$	$15\frac{1}{16}$	$3\frac{9}{16}$	$21\frac{5}{6}$	$28\frac{7}{8}$
	$5\frac{3}{4}$	$7\frac{3}{5}$	$2\frac{7}{12}$	$9\frac{5}{8}$	$6\frac{2}{5}$	$7\frac{5}{6}$

Subtract. Each answer must be in lowest terms.

6.	$\frac{1}{3}$	$\frac{3}{4}$	$\frac{5}{6}$	$\frac{3}{5}$	$\frac{5}{6}$	$\frac{7}{8}$
	$\frac{1}{5}$	$\frac{1}{6}$	$\frac{1}{10}$	$\frac{1}{6}$	$\frac{5}{12}$	$\frac{5}{12}$
7.	$5\frac{1}{2}$	$7\frac{2}{3}$	$8\frac{5}{6}$	$6\frac{1}{3}$	$5\frac{7}{10}$	$8\frac{1}{6}$
	$3\frac{2}{5}$	$1\frac{1}{9}$	$6\frac{3}{4}$	$3\frac{1}{2}$	$3\frac{3}{4}$	$6\frac{5}{8}$
8.	$8\frac{4}{15}$	$6\frac{1}{2}$	$9\frac{3}{5}$	$4\frac{1}{2}$	$9\frac{3}{10}$	$7\frac{1}{5}$
	$3\frac{1}{6}$	$2\frac{5}{16}$	$5\frac{1}{4}$	$1\frac{7}{8}$	$2\frac{1}{2}$	$4\frac{2}{3}$
9.	$9\frac{1}{9}$	$11\frac{5}{12}$	$14\frac{1}{2}$	$16\frac{3}{8}$	$18\frac{2}{5}$	$15\frac{3}{4}$
	$4\frac{5}{6}$	$3\frac{3}{4}$	$9\frac{2}{7}$	$8\frac{7}{16}$	$9\frac{3}{4}$	$7\frac{5}{6}$
10.	$7\frac{3}{8}$	$15\frac{1}{10}$	$12\frac{3}{8}$	$17\frac{5}{16}$	$24\frac{2}{5}$	$35\frac{3}{10}$
	$5\frac{7}{12}$	$6\frac{3}{5}$	$9\frac{2}{3}$	$13\frac{3}{4}$	$19\frac{5}{6}$	$16\frac{3}{4}$



USING FRACTIONS AT HOME

1. Mrs. Young finds that a good house-keeper must know fractions well. If she used $\frac{1}{3}$ of a cup of sugar in making muffins and $\frac{3}{4}$ of a cup of sugar in making a cake, how much sugar did she use altogether?

2. She uses a pressure cooker. It takes $\frac{2}{3}$ hr. to cook a roast of beef and $\frac{5}{6}$ hr. to cook a leg of lamb. How much longer does it take to cook the lamb?

3. She went to the market to buy a chicken for Sunday's dinner. One chicken she looked at weighed $6\frac{1}{8}$ lb., and another weighed $4\frac{9}{16}$ lb. What was the difference in the weights of the chickens?

4. One week she used $2\frac{2}{3}$ doz. eggs and the next week she used $1\frac{1}{2}$ doz. eggs. How many dozen eggs did she use during the two weeks?

5. Sally Young helps her mother with the housework. On Saturday she took $1\frac{3}{4}$ hr. to dust her father's books and $1\frac{5}{6}$ hr. for the ironing. How many hours did she work?

6. Mrs. Young bought $5\frac{5}{8}$ yd. of curtain material for the dining-room and $8\frac{1}{6}$ yd. for the living room. How many more yards of curtain material did she buy for the living room than for the dining-room?

7. Mr. Young had the house painted last summer. He bought $10\frac{5}{8}$ gal. of white paint and $2\frac{1}{3}$ gal. of green paint for the trimmings. How many gallons did he buy?

DIAGNOSTIC TEST IN ADDITION OF FRACTIONS

The work below will test you on the kinds of examples you should know in addition of fractions. If you make mistakes in any kind go back and do again the exercises on the page number which is shown at the right.

						Page
ADDING LIKE FRACTIONS AND MIXED NUMBERS HAVING LIKE FRACTIONS						
1.	$\frac{1}{8}$	$\frac{7}{10}$	$4\frac{3}{16}$	$6\frac{1}{5}$	$9\frac{7}{12}$	117
	$\frac{3}{8}$	$\frac{9}{10}$	$2\frac{7}{16}$	$7\frac{3}{5}$	$3\frac{1}{12}$	118
ADDING MIXED NUMBERS WITH CARRYING						
2.	$3\frac{3}{4}$	$4\frac{11}{12}$	$7\frac{5}{6}$	$6\frac{9}{10}$	$8\frac{9}{16}$	127
	$1\frac{3}{4}$	$5\frac{7}{12}$	$2\frac{5}{6}$	$3\frac{3}{10}$	$4\frac{11}{16}$	
ADDING UNLIKE FRACTIONS AND MIXED NUMBERS						
(a) The common denominator is the denominator of one of the fractions.						
3.	$\frac{1}{2}$	$\frac{2}{3}$	$3\frac{1}{8}$	$7\frac{3}{10}$	$9\frac{5}{16}$	138
	$\frac{3}{8}$	$\frac{1}{9}$	$2\frac{7}{16}$	$4\frac{1}{5}$	$5\frac{1}{4}$	139
ADDING MIXED NUMBERS WITH CARRYING						
4.	$7\frac{3}{4}$	$10\frac{3}{5}$	$3\frac{5}{6}$	$6\frac{11}{16}$	$4\frac{7}{9}$	140
	$6\frac{1}{2}$	$2\frac{9}{10}$	$8\frac{7}{12}$	$5\frac{3}{8}$	$11\frac{1}{3}$	
(b) The common denominator is the product of the denominators.						
5.	$\frac{1}{3}$	$\frac{3}{5}$	$2\frac{1}{8}$	$14\frac{1}{3}$	$7\frac{2}{5}$	150
	$\frac{1}{2}$	$\frac{1}{4}$	$6\frac{2}{3}$	$5\frac{3}{10}$	$12\frac{1}{6}$	
ADDING MIXED NUMBERS WITH CARRYING						
6.	$5\frac{1}{2}$	$7\frac{5}{8}$	$11\frac{3}{5}$	$2\frac{2}{3}$	$24\frac{5}{6}$	150
	$8\frac{5}{7}$	$9\frac{2}{3}$	$6\frac{3}{4}$	$17\frac{3}{5}$	$6\frac{4}{5}$	
(c) Find the least common denominator.						
7.	$\frac{1}{4}$	$\frac{9}{10}$	$7\frac{1}{8}$	$5\frac{1}{6}$	$9\frac{3}{10}$	154
	$\frac{1}{6}$	$\frac{1}{4}$	$3\frac{5}{12}$	$6\frac{1}{10}$	$2\frac{1}{8}$	
ADDING MIXED NUMBERS WITH CARRYING						
8.	$3\frac{4}{9}$	$4\frac{11}{12}$	$13\frac{3}{4}$	$6\frac{9}{10}$	$18\frac{5}{6}$	154
	$9\frac{5}{6}$	$6\frac{3}{8}$	$2\frac{5}{6}$	$14\frac{3}{4}$	$2\frac{3}{8}$	

DIAGNOSTIC TEST IN SUBTRACTION OF FRACTIONS

The work below will test you on the kinds of examples you should know in subtraction of fractions. If you make mistakes in any kind go back and do again the exercises on the page number which is shown at the right.

						Page
Subtracting Fractions and Mixed Numbers Having Like Fractions						
1.	$\frac{5}{6}$	$\frac{7}{12}$	$5\frac{3}{4}$	$3\frac{9}{10}$	$8\frac{11}{16}$	119
	$\frac{1}{6}$	$\frac{5}{12}$	$2\frac{1}{4}$	$1\frac{3}{10}$	$4\frac{7}{16}$	120
Subtracting Mixed Numbers with Borrowing						
2.	4	7	$6\frac{2}{9}$	$9\frac{1}{4}$	$5\frac{1}{10}$	128
	$\frac{2}{5}$	$3\frac{5}{8}$	$\frac{5}{9}$	$5\frac{3}{4}$	$3\frac{7}{10}$	129, 130
Subtracting Unlike Fractions and Mixed Numbers						
(a) The common denominator is the denominator of one of the fractions.						
3.	$\frac{1}{2}$	$\frac{4}{5}$	$8\frac{7}{8}$	$9\frac{11}{12}$	$11\frac{5}{8}$	141
	$\frac{1}{4}$	$\frac{1}{10}$	$3\frac{1}{2}$	$6\frac{1}{4}$	$4\frac{9}{16}$	142
Subtracting Mixed Numbers with Borrowing						
4.	$5\frac{3}{8}$	$6\frac{1}{4}$	$12\frac{1}{9}$	$14\frac{9}{12}$	$7\frac{1}{5}$	143
	$1\frac{1}{2}$	$3\frac{7}{12}$	$5\frac{2}{3}$	$7\frac{5}{6}$	$4\frac{7}{10}$	
(b) The common denominator is the product of the denominators.						
5.	$\frac{1}{2}$	$\frac{3}{4}$	$9\frac{4}{5}$	$7\frac{1}{3}$	$6\frac{5}{6}$	151
	$\frac{1}{5}$	$\frac{2}{3}$	$2\frac{1}{4}$	$5\frac{1}{8}$	$4\frac{2}{5}$	
Subtracting Mixed Numbers with Borrowing						
6.	$8\frac{1}{3}$	$5\frac{1}{2}$	$11\frac{2}{3}$	$15\frac{1}{4}$	$17\frac{3}{8}$	151
	$6\frac{3}{4}$	$3\frac{6}{7}$	$2\frac{4}{5}$	$8\frac{3}{5}$	$12\frac{2}{3}$	
(c) Find the least common denominator.						
7.	$\frac{3}{4}$	$\frac{5}{6}$	$4\frac{1}{6}$	$6\frac{5}{8}$	$9\frac{7}{8}$	155
	$\frac{1}{6}$	$\frac{4}{9}$	$2\frac{1}{10}$	$1\frac{1}{6}$	$5\frac{3}{10}$	
Subtracting Mixed Numbers with Borrowing						
8.	$5\frac{1}{4}$	$6\frac{1}{12}$	$8\frac{1}{6}$	$10\frac{5}{6}$	$13\frac{1}{9}$	155
	$3\frac{3}{10}$	$2\frac{5}{8}$	$1\frac{9}{10}$	$5\frac{7}{8}$	$7\frac{1}{6}$	

PRACTICE IN ADDITION AND SUBTRACTION OF FRACTIONS

Add. Check each answer.

1.	$3\frac{1}{3}$	$4\frac{3}{5}$	$1\frac{1}{12}$	$7\frac{9}{16}$	$2\frac{5}{6}$
	$2\frac{1}{6}$	$5\frac{7}{10}$	$6\frac{3}{4}$	$6\frac{5}{8}$	$9\frac{11}{12}$
2.	$8\frac{3}{4}$	$6\frac{2}{5}$	$9\frac{5}{12}$	$3\frac{1}{4}$	$11\frac{1}{2}$
	$7\frac{5}{16}$	$9\frac{3}{4}$	$4\frac{2}{3}$	$7\frac{1}{6}$	$4\frac{1}{5}$
3.	$6\frac{5}{8}$	$15\frac{2}{3}$	$10\frac{3}{4}$	$8\frac{1}{3}$	$17\frac{2}{3}$
	$5\frac{5}{6}$	$5\frac{3}{5}$	$2\frac{3}{10}$	$9\frac{1}{4}$	$4\frac{3}{8}$
4.	$5\frac{2}{5}$	$8\frac{5}{6}$	$14\frac{5}{8}$	$16\frac{9}{10}$	$1\frac{1}{6}$
	$7\frac{1}{6}$	$4\frac{3}{5}$	$6\frac{3}{10}$	$8\frac{2}{3}$	$9\frac{5}{8}$
5.	$13\frac{3}{4}$	$12\frac{9}{10}$	$2\frac{5}{6}$	$18\frac{7}{8}$	$2\frac{7}{12}$
	$9\frac{4}{5}$	$6\frac{3}{4}$	$4\frac{7}{10}$	$5\frac{5}{12}$	$11\frac{7}{10}$

Subtract. Check each exercise.

6.	$3\frac{5}{6}$	$9\frac{2}{3}$	$5\frac{3}{5}$	$15\frac{3}{4}$	$7\frac{1}{3}$
	$1\frac{2}{3}$	$7\frac{11}{12}$	$2\frac{3}{10}$	$8\frac{15}{16}$	$2\frac{1}{4}$
7.	$14\frac{1}{2}$	$4\frac{2}{5}$	$16\frac{3}{16}$	$10\frac{1}{2}$	$16\frac{1}{3}$
	$5\frac{7}{8}$	$3\frac{5}{6}$	$9\frac{3}{4}$	$4\frac{2}{3}$	$4\frac{5}{8}$
8.	$7\frac{5}{6}$	$13\frac{1}{12}$	$16\frac{1}{4}$	$8\frac{3}{10}$	$19\frac{3}{8}$
	$1\frac{1}{4}$	$5\frac{1}{4}$	$8\frac{7}{10}$	$5\frac{2}{3}$	$7\frac{7}{12}$
9.	$9\frac{1}{2}$	$11\frac{2}{3}$	$9\frac{9}{10}$	$12\frac{1}{5}$	$10\frac{1}{3}$
	$4\frac{3}{5}$	$3\frac{7}{8}$	$4\frac{3}{4}$	$5\frac{1}{4}$	$7\frac{3}{5}$
10.	$11\frac{3}{8}$	$2\frac{1}{6}$	$12\frac{3}{15}$	$15\frac{1}{10}$	$14\frac{5}{12}$
	$5\frac{5}{6}$	$1\frac{5}{9}$	$2\frac{5}{6}$	$3\frac{5}{12}$	$12\frac{9}{16}$

KEEPING THE TOOLS SHARP

Add. Check each answer.

1.

4746	5908	4785	3896	9789
8405	6439	6592	9364	2514
1874	7896	5748	5907	8974
3520	1735	3366	1485	6097
8987	8189	7918	6290	3358
3797	2434	6392	2662	4482

Subtract. Check each answer.

2.

5649	8952	8493	7546	1861
5386	8397	3669	2778	972

3.

5300	7000	9020	7005	5102
1378	6279	6254	4706	5007

4.

16241	45705	76939	60508
6378	40927	68285	10509

Multiply. Check each answer.

5.

7210	8013	3761	6329	5316
4	6	7	8	5

6.

8030	4809	6708	578	985
3	8	5	60	40

7.

86	568	406	593	854	815
93	46	287	360	501	704

Divide. Check each answer.

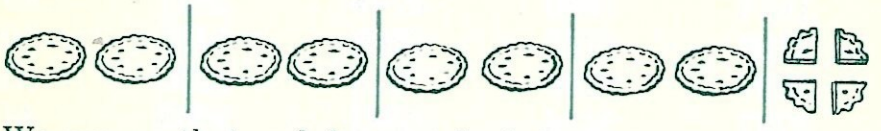
8. $6\overline{)5286}$ $8\overline{)6499}$ $7\overline{)5880}$ $9\overline{)4569}$

9. $32\overline{)13664}$ $54\overline{)26127}$ $29\overline{)13499}$ $48\overline{)34949}$

10. $19\overline{)15506}$ $24\overline{)2383}$ $67\overline{)40803}$ $92\overline{)44185}$

WRITING REMAINDERS AS FRACTIONS

Mrs. Lewis found 9 cookies in the cookie-box. If she divided the 9 cookies among 4 boys, how many cookies did each boy get?
Below we see the 9 cookies.



We can see that each boy got 2 whole cookies and $\frac{1}{4}$ of the other cookie. So each boy got $2\frac{1}{4}$ cookies.

Here is a short way to find how many cookies each boy got:

Think, "4's in 9 are 2". Write the 2 as shown.
Write the remainder, 1, as the numerator of a fraction with the divisor, 4, as the denomintor.
Write the $\frac{1}{4}$ as shown.
So each boy got $2\frac{1}{4}$ cookies.

$$\begin{array}{r} 2\frac{1}{4} \\ 4\overline{)9} \\ \underline{8} \\ 1 \end{array}$$

Rule: In division, the remainder may be changed to a fraction by writing the remainder as the numerator and the divisor as the denominator of the fraction. The fraction must always be changed to lowest terms.

Divide. Write the remainders as fractions in lowest terms.

1.	$3\overline{)16}$	$4\overline{)22}$	$6\overline{)50}$	$8\overline{)45}$	$7\overline{)38}$
2.	$6\overline{)74}$	$5\overline{)73}$	$7\overline{)81}$	$9\overline{)105}$	$8\overline{)92}$
3.	$5\overline{)162}$	$6\overline{)214}$	$9\overline{)318}$	$4\overline{)561}$	$8\overline{)324}$
4.	$9\overline{)2135}$	$7\overline{)3594}$	$5\overline{)1509}$	$6\overline{)4315}$	$9\overline{)6047}$

5. Fred had a board which was 18 ft. long. He cut it into 4 equal pieces. How long was each piece?

6. Joan had a piece of ribbon 40 in. long. If she cut it into 6 equal pieces, how many inches long would each piece be?

USING COMMON SENSE IN WRITING REMAINDERS

In problems using division, the remainder is sometimes left as a whole number and sometimes the remainder is written as a fraction. You can tell whether the remainder should be left as a whole number or written as a fraction if you use *common sense*. Study the examples below.

Example I. Miss Brown had 25 books to give as prizes. If she divided the books equally among 6 boys, how many books would each boy get?

$$\begin{array}{r} 4R1 \\ 6\overline{)25} \\ \underline{24} \\ 1 \end{array}$$

To find out we *divide* 25 by 6.
Each boy would get 4 books. There would be 1 book left over. It is *not sensible or reasonable* to divide 1 book among 6 boys, so *the remainder*, 1, must be left as a *whole number*.

Example II. Bill had a rope 17 yards long from which he made 6 skipping ropes. How long was each skipping rope?

$$\begin{array}{r} 2\frac{5}{6} \\ 6\overline{)17} \\ \underline{12} \\ 5 \end{array}$$

To find out we *divide* 17 by 6.
Each rope was $2\frac{5}{6}$ yd. long. *It is sensible and reasonable* to divide a rope into fractional parts.
So the *remainder*, 5, should be written as a *fraction*, $\frac{5}{6}$.

Be sure the way you write the remainder is sensible.

1. Mrs. McLeod had 17 quarts of blue-berries which she divided evenly among 4 of her neighbours. How many quarts did each receive?

2. If Tony divided 32 marbles among 5 boys so that each boy got same number, how many did each get?

3. How many 15¢ books can be bought with 50¢?

4. If 6 chickens weigh 43 lb., what is their average weight?

5. May gathered 138 eggs in the hen-coop. How many dozen eggs did she gather?

6. How many boxes are filled in packing 153 electric light bulbs if each box holds 24 bulbs?

HOW MUCH DOES ONE COST?

Last Saturday, Mr. Groves, the grocer, was selling grape-fruit at a special price of 3 for 23¢. How much would a customer pay for 1 grape-fruit?

To find out the cost of one grape-fruit we divide 23 by 3.

When we divide 23¢ by 3 we find that one grape-fruit would cost $7\frac{2}{3}$¢. But we cannot pay $\frac{2}{3}$¢, so we must pay 8¢.

So the customer would pay 8¢ for 1 grape-fruit.

$$\begin{array}{r} 7\ \frac{2}{3}\text{¢} \\ 3\overline{)23\text{¢}} \\ \underline{21} \\ 2 \end{array}$$

When the cost of an article has a fraction of a cent in it, the store-keeper charges the extra cent.

Mr. Groves, the grocer, put a card in his store window showing the prices of articles as shown below. In each case find the cost of one article.

1. 2 packages of corn flakes for 25¢

2. 3 boxes of matches for 29¢

3. 4 tins of apple juice for 38¢

4. 5 pounds of carrots for 37¢

5. 6 cakes of soap for 45¢

6. 2 pounds of prunes for 29¢

7. 3 lemons for 14¢

8. 2 pounds of new cabbage for 15¢

9. 3 pounds of boneless cod for $1.00

10. A dozen Southern Spy apples for 49¢

11. 3 pounds of onions for 20¢

12. 2 cans of vegetable soup for 19¢

13. 6 electric light bulbs for 85¢

14. A dozen plums for 45¢

15. 3 note-books for 25¢

16. How much will 1 dozen oranges cost if they are selling 3 dozen for 68¢?

HOW MUCH FOR SEVERAL?

Fred paid \$ .45 for 3 handkerchiefs. At the same rate, how much would 10 handkerchiefs cost?
To find out, we find the cost of 1 handkerchief and then find the cost of 10.

3 handkerchiefs cost \$ .45

1 handkerchief costs \$ $\frac{.45}{3}$ = \$ .15

$$3\overline{)45}$$ 15

Then 10 handkerchiefs cost $10 \times \$ .15 = \$1.50$
So 10 handkerchiefs would cost \$1.50

1. Mrs. Truman paid 20¢ for 4 lemons. How much would she have to pay for 9 lemons at the same price?

2. Miss Ross, the teacher, paid 24¢ for 6 pencils. At the same rate, how much would 25 pencils cost?

3. Frank loved to make kites. If it took him 2 hours to make 4 kites, how long would it take him to make 10 kites at the same rate?

4. Allan sold 12 magazines and made 60¢ for himself. At the same rate, how much would Allan have made if he sold 35 magazines?

5. Mr. Saunders used 7 gallons of gasoline in driving his automobile 147 miles. At the same rate, how many miles would he be able to drive on 16 gallons of gasoline?

6. Sally is reading a novel. Last evening she read 8 pages in 32 min. At the same rate, how long would she take to read 50 pages?

7. Mr. Morgan worked 6 hr. yesterday and earned \$3.60. At the same rate, how much would he earn in 9 hr.?

8. An airplane travelled 1125 miles in 5 hr. At the same rate, how far would it travel in 8 hr.?

KEEPING THE TOOLS SHARP

Add. Check each answer. All answers must be in lowest terms.

1.

$\frac{1}{8}$	$\frac{4}{5}$	$\frac{1}{3}$	$\frac{7}{10}$	$\frac{2}{3}$	$\frac{5}{6}$
$+\frac{5}{8}$	$+\frac{3}{5}$	$+\frac{1}{6}$	$+\frac{2}{5}$	$+\frac{1}{4}$	$+\frac{3}{8}$

2.

$7\frac{3}{10}$	$2\frac{2}{3}$	$9\frac{11}{12}$	$9\frac{1}{2}$	$12\frac{5}{8}$	$11\frac{7}{16}$
$+4\frac{1}{10}$	$+8\frac{2}{3}$	$+5\frac{7}{12}$	$+2\frac{5}{12}$	$+7\frac{3}{4}$	$+12\frac{7}{8}$

3.

$6\frac{1}{3}$	$5\frac{2}{5}$	$6\frac{3}{4}$	$9\frac{1}{2}$	$7\frac{9}{10}$	$4\frac{2}{3}$
$+7\frac{1}{4}$	$+8\frac{1}{2}$	$+2\frac{4}{5}$	$+8\frac{6}{7}$	$+7\frac{1}{3}$	$+6\frac{5}{8}$

4.

$2\frac{1}{10}$	$11\frac{2}{9}$	$13\frac{3}{4}$	$14\frac{7}{10}$	$15\frac{7}{8}$	$8\frac{5}{6}$
$+7\frac{1}{4}$	$+3\frac{1}{6}$	$+6\frac{5}{6}$	$+10\frac{5}{8}$	$+7\frac{7}{12}$	$+16\frac{3}{10}$

Subtract. Check each answer. All answers must be in lowest terms.

5.

$\frac{4}{5}$	$\frac{7}{8}$	$\frac{1}{3}$	$\frac{3}{4}$	$\frac{5}{6}$	$\frac{3}{4}$
$-\frac{3}{5}$	$-\frac{3}{16}$	$-\frac{1}{4}$	$-\frac{1}{5}$	$-\frac{1}{8}$	$-\frac{3}{10}$

6.

6	8	10	$7\frac{7}{8}$	$9\frac{3}{10}$	$12\frac{3}{16}$
$-\frac{3}{8}$	$-\frac{2}{5}$	$-\frac{5}{6}$	$-4\frac{3}{8}$	$-2\frac{7}{10}$	$-6\frac{5}{16}$

7.

$4\frac{1}{2}$	$10\frac{7}{12}$	$11\frac{3}{8}$	$9\frac{1}{2}$	$13\frac{1}{4}$	$17\frac{1}{6}$
$-2\frac{1}{10}$	$-6\frac{5}{6}$	$-7\frac{11}{16}$	$-6\frac{1}{3}$	$-4\frac{2}{3}$	$-9\frac{4}{5}$

8.

$6\frac{7}{8}$	$8\frac{1}{6}$	$9\frac{1}{4}$	$8\frac{2}{3}$	$10\frac{1}{2}$	$12\frac{2}{5}$
$-3\frac{1}{2}$	$-5\frac{1}{3}$	$-4\frac{4}{8}$	$-6\frac{2}{5}$	$-5\frac{4}{5}$	$-8\frac{3}{4}$

9.

$6\frac{1}{4}$	$9\frac{5}{8}$	$10\frac{1}{8}$	$13\frac{1}{4}$	$16\frac{5}{9}$	$20\frac{5}{6}$
$-1\frac{1}{6}$	$-5\frac{3}{10}$	$-2\frac{1}{6}$	$-5\frac{7}{10}$	$-7\frac{5}{6}$	$-11\frac{13}{15}$

THE MEANING OF MULTIPLYING A FRACTION BY A WHOLE NUMBER

There are 7 days in a week. How many days are there in 3 weeks?

To find out we can multiply 7 by 3. $3 \times 7 = 21$

What does $3 \times 7 = 21$ mean? It means $7 + 7 + 7$

Multiplication is a short way of adding numbers that are the same.

When we multiply a fraction by a whole number the meaning is the same as when we multiply a whole number by a whole number.

Study this problem.

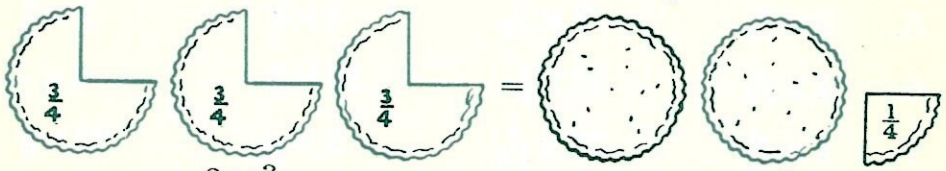
The Dunn family ate $\frac{3}{4}$ of a pie each day. How many pies did they eat in 3 days?

To find out we can multiply $3 \times \frac{3}{4}$.

But $3 \times \frac{3}{4}$ means $\frac{3}{4} + \frac{3}{4} + \frac{3}{4} = \frac{9}{4} = 2\frac{1}{4}$

So $3 \times \frac{3}{4} = 2\frac{1}{4}$

You can see that this is so from the pictures below.



$3 \times \frac{3}{4}$ = $2\frac{1}{4}$

Let us look at $3 \times \frac{3}{4} = \frac{9}{4} = 2\frac{1}{4}$ again and see if we can discover a trick for multiplying a fraction by a whole number. We can see that we can get 9 by multiplying the numerator of the fraction, 3, by the whole number, 3. Then we get the answer $2\frac{1}{4}$ by dividing the product, 9, by the denominator of the fraction, 4.

Rule: To multiply a fraction by a whole number, multiply the numerator of the fraction by the whole number and divide the product by the denominator of the fraction. Be sure the fraction in the answer is in lowest terms.

MULTIPLYING A FRACTION BY A WHOLE NUMBER

Mr. Mann is a coal hauler. He hauls $\frac{2}{3}$ of a ton each trip. How many tons of coal does he haul in 5 trips?

To find out how many tons he hauls we multiply $\frac{2}{3}$ by 5.

Multiply the numerator 2 by 5. $5 \times 2 = 10$.

Divide the product, 10, by the denominator 3. $\frac{10}{3} = 3\frac{1}{3}$

So he hauls $3\frac{1}{3}$ tons in 5 trips.

$$5 \times \tfrac{2}{3} = \tfrac{10}{3} = 3\tfrac{1}{3}$$

Tell how these are done.

$$15 \times \tfrac{1}{10} = \tfrac{15}{10} = 1\tfrac{5}{10} = 1\tfrac{1}{2}$$

$$8 \times \tfrac{3}{4} = \tfrac{24}{4} = 6 \quad \text{and} \quad 2 \times \tfrac{3}{8} = \tfrac{6}{8} = \tfrac{3}{4}$$

Multiply. Each answer must be in lowest terms.

1.	$7 \times \frac{2}{5}$	$9 \times \frac{1}{4}$	$5 \times \frac{1}{2}$	$8 \times \frac{2}{3}$
2.	$6 \times \frac{3}{8}$	$4 \times \frac{5}{6}$	$12 \times \frac{1}{10}$	$3 \times \frac{5}{12}$
3.	$9 \times \frac{1}{3}$	$8 \times \frac{1}{4}$	$6 \times \frac{2}{3}$	$24 \times \frac{1}{2}$
4.	$5 \times \frac{1}{6}$	$2 \times \frac{2}{5}$	$10 \times \frac{1}{12}$	$4 \times \frac{1}{6}$
5.	$3 \times \frac{7}{10}$	$7 \times \frac{1}{12}$	$4 \times \frac{4}{5}$	$2 \times \frac{7}{8}$
6.	$2 \times \frac{5}{16}$	$13 \times \frac{1}{8}$	$10 \times \frac{3}{5}$	$6 \times \frac{7}{16}$
7.	$7 \times \frac{9}{10}$	$10 \times \frac{7}{12}$	$9 \times \frac{1}{10}$	$22 \times \frac{4}{7}$
8.	$30 \times \frac{3}{5}$	$18 \times \frac{3}{4}$	$20 \times \frac{2}{3}$	$11 \times \frac{5}{6}$
9.	$16 \times \frac{3}{4}$	$32 \times \frac{1}{3}$	$45 \times \frac{4}{5}$	$18 \times \frac{3}{10}$
10.	$14 \times \frac{5}{12}$	$24 \times \frac{5}{9}$	$11 \times \frac{4}{16}$	$22 \times \frac{7}{8}$
11.	$36 \times \frac{5}{6}$	$10 \times \frac{3}{4}$	$20 \times \frac{5}{8}$	$48 \times \frac{9}{16}$

12. A package of breakfast food weighs $\frac{3}{4}$ lb. How much will 15 such packages weigh?

13. When Mrs. Bowden cooks her favourite cake she uses $\frac{1}{2}$ cup sugar. How many cups of sugar would she use in making 5 of her favourite cakes?

MULTIPLYING A WHOLE NUMBER BY A FRACTION

Let us find out what it *means* to multiply a whole number by a fraction. For example, what does $\frac{2}{3} \times 24$ mean?

Mrs. Ford bought $\frac{2}{3}$ of a dozen buns at 24¢ a dozen. How much did she pay for the buns?

We know that 3 doz. buns would cost $3 \times 24¢$; so $\frac{2}{3}$ doz. buns would cost $\frac{2}{3} \times 24¢$. We know, too, that the buns will cost Mrs. Ford $\frac{2}{3}$ of 24¢

So $\frac{2}{3} \times 24$ is the same as $\frac{2}{3}$ of 24.

On page 111 we learned how to find $\frac{2}{3}$ of 24. $\frac{1}{3}$ of 24 is 8, so $\frac{2}{3}$ of 24 is 16.

In arithmetic "of" means $\times$.

So $\frac{2}{3} \times 24 = 16$

We can see that if the whole number, 24, is multiplied by the numerator, 2, of the fraction, $\frac{2}{3}$, and the product, 48, divided by the denominator, 3, the answer will be 16, as shown below.

$$\frac{2}{3} \times 24 = \frac{48}{3} = 16$$

Rule: To multiply a whole number by a fraction, multiply the whole number by the numerator of the fraction and divide the product by the denominator of the fraction. Be sure the fraction in the answer is in lowest terms.

1. Tell how these are done.

$\frac{3}{5} \times 13 = \frac{39}{5} = 7\frac{4}{5}$ and $\frac{1}{6} \times 4 = \frac{4}{6} = \frac{2}{3}$

Multiply.

2.	$\frac{1}{3} \times 15$	$\frac{3}{4} \times 80$	$\frac{3}{10} \times 11$	$\frac{1}{8} \times 27$
3.	$\frac{3}{8} \times 30$	$\frac{5}{6} \times 21$	$\frac{1}{2} \times 9$	$\frac{1}{8} \times 6$
4.	$\frac{2}{5} \times 18$	$\frac{7}{12} \times 60$	$\frac{2}{5} \times 2$	$\frac{7}{10} \times 12$
5.	$\frac{5}{16} \times 11$	$\frac{5}{8} \times 32$	$\frac{1}{16} \times 12$	$\frac{5}{12} \times 42$

6. Show that $\frac{3}{5} \times 13$ is the same as $13 \times \frac{3}{5}$

MULTIPLYING A MIXED NUMBER BY A WHOLE NUMBER

Bob's father raises turkeys. At Thanksgiving he sold 3 turkeys. If the average weight of the turkeys was $12\frac{7}{8}$ lb., how much did the 3 turkeys weigh?

To find the weight of the turkeys we multiply $12\frac{7}{8}$ by 3.

$$\begin{array}{r} 12\frac{7}{8} \\ \times\ 3 \\ \hline 2\frac{5}{8} \\ 36 \\ \hline 38\frac{5}{8} \end{array}$$

Write the numbers as shown.

(1) Multiuly $\frac{7}{8}$ by 3. $3 \times \frac{7}{8} = \frac{21}{8} = 2\frac{5}{8}$
Write the $2\frac{5}{8}$ with $\frac{5}{8}$ under $\frac{7}{8}$.

(2) Multiply 12 by 3. $3 \times 12 = 36$.
Write the 36 as shown.

(3) Add $2\frac{5}{8}$ and 36.

Tell how this is done.

$$\begin{array}{r} 25\frac{2}{3} \\ \times\ 6 \\ \hline 4 \\ 150 \\ \hline 154 \end{array}$$

So the turkeys weighed $38\frac{5}{8}$ lb.

Multiply. Each answer must be in lowest terms.

1.	$6\frac{1}{2}$ × 5	$7\frac{5}{8}$ × 3	$9\frac{3}{5}$ × 8	$12\frac{5}{16}$ × 7	$16\frac{2}{3}$ × 13
2.	$8\frac{1}{4}$ × 6	$7\frac{9}{10}$ × 2	$15\frac{3}{8}$ × 4	$16\frac{5}{12}$ × 8	$32\frac{7}{16}$ × 14
3.	$7\frac{2}{5}$ × 5	$9\frac{1}{2}$ × 6	$10\frac{3}{4}$ × 8	$11\frac{1}{3}$ × 9	$14\frac{5}{6}$ × 12
4.	$3\frac{1}{8}$ × 4	$9\frac{3}{16}$ × 3	$8\frac{1}{12}$ × 6	$19\frac{1}{5}$ × 2	$36\frac{5}{16}$ × 2
5.	$36\frac{3}{10}$ × 20	$24\frac{1}{6}$ × 11	$27\frac{3}{4}$ × 14	$36\frac{1}{16}$ × 13	$41\frac{7}{8}$ × 15

6. A mail man walks $3\frac{3}{4}$ mi. each day delivering the mail. How many miles does he walk in 6 days?

7. Mr. Brown is a coal hauler. If he delivered 5 loads of coal with $2\frac{1}{2}$ tons in each load, how many tons did he deliver?

MULTIPLYING A WHOLE NUMBER BY A MIXED NUMBER

Mrs. Cook bought $3\frac{1}{4}$ yd. of flannel at \$ .48 a yard. How much did she pay for it?

To find how much she paid for the flannel we *multiply* \$ .48 by $3\frac{1}{4}$.

\$ .48
$3\frac{1}{4}$
12
1 44
\$1.56

Write the numbers as shown.

(1) Multiply 48 by $\frac{1}{4}$. $\frac{1}{4} \times 48 = 12$. Write the 12 as shown.

(2) Multiply 48 by 3. $3 \times 48 = 144$. Write the 144 as shown.

(3) Add 12 and 144.

So she paid \$1.56 for the flannel.

Tell how this is done.

$$\begin{array}{r} 14 \\ 2\frac{1}{6} \\ \hline 2\frac{1}{3} \\ 28 \\ \hline 30\frac{1}{3} \end{array}$$

Multiply. Each answer must be in lowest terms.

1.	8 $3\frac{1}{2}$	12 $4\frac{2}{3}$	20 $2\frac{1}{4}$	50 $7\frac{3}{10}$	32 $6\frac{5}{8}$
2.	7 $2\frac{1}{3}$	5 $4\frac{5}{6}$	12 $1\frac{4}{5}$	15 $6\frac{3}{8}$	19 $3\frac{7}{10}$
3.	10 $5\frac{3}{4}$	14 $3\frac{1}{6}$	8 $2\frac{7}{12}$	20 $6\frac{1}{8}$	14 $7\frac{3}{16}$
4.	7 $3\frac{1}{8}$	8 $4\frac{1}{16}$	3 $2\frac{3}{10}$	9 $7\frac{1}{12}$	5 $4\frac{1}{6}$
5.	15 $4\frac{1}{3}$	21 $8\frac{2}{5}$	11 $7\frac{5}{16}$	16 $4\frac{9}{10}$	36 $5\frac{7}{12}$

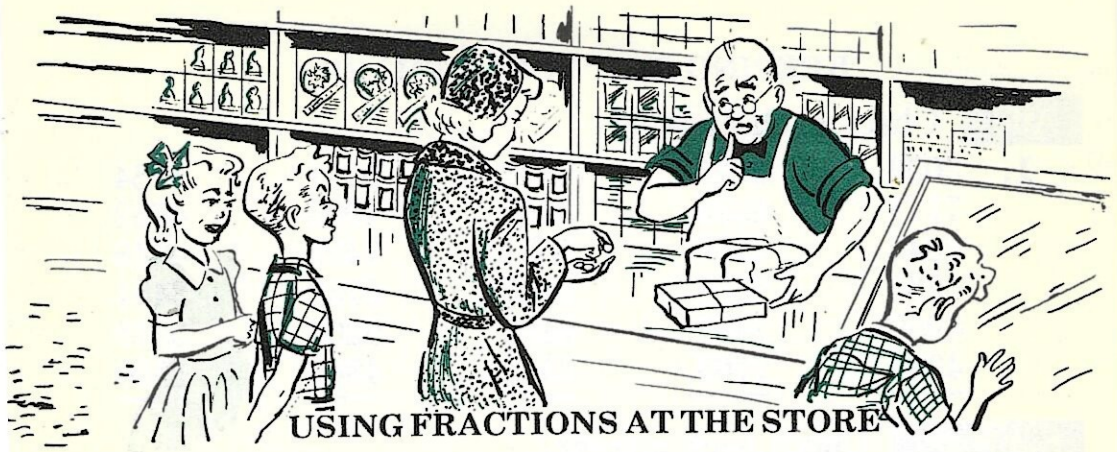
6. Mrs. Green bought $4\frac{3}{8}$ lb. of lamb at \$ .56 a pound. How much did she pay for the lamb?

7. If lobster costs \$.44 cents a pound, how much would you pay for $7\frac{3}{4}$ lb.?

PRACTICE IN MULTIPLICATION OF FRACTIONS

Multiply. Each answer must be in lowest terms.

1.	$7 \times \frac{1}{2}$	$5 \times \frac{2}{3}$	$6 \times \frac{3}{8}$	$10 \times \frac{5}{12}$
2.	$9 \times \frac{5}{8}$	$20 \times \frac{7}{12}$	$2 \times \frac{3}{10}$	$3 \times \frac{1}{8}$
3.	$4 \times \frac{1}{16}$	$9 \times \frac{2}{3}$	$12 \times \frac{5}{6}$	$24 \times \frac{11}{12}$
4.	$\frac{2}{5} \times 15$	$\frac{7}{8} \times 40$	$\frac{5}{12} \times 60$	$\frac{3}{10} \times 9$
5.	$\frac{3}{4} \times 18$	$\frac{2}{9} \times 11$	$\frac{11}{16} \times 24$	$\frac{4}{5} \times 13$
6.	$\frac{7}{10} \times 22$	$\frac{1}{5} \times 4$	$\frac{1}{10} \times 8$	$\frac{3}{16} \times 4$
7.	$5\frac{3}{4}$ 3	$8\frac{2}{3}$ 4	$9\frac{5}{6}$ 7	$7\frac{5}{16}$ 5	$13\frac{1}{8}$ 9
8.	$10\frac{1}{4}$ 6	$6\frac{3}{8}$ 4	$14\frac{15}{16}$ 2	$13\frac{5}{9}$ 3	$15\frac{9}{10}$ 4
9.	$3\frac{1}{2}$ 8	$5\frac{1}{3}$ 9	$21\frac{3}{5}$ 5	$11\frac{4}{7}$ 7	$34\frac{5}{8}$ 16
10.	$8\frac{1}{8}$ 7	$9\frac{1}{6}$ 4	$7\frac{5}{16}$ 3	$9\frac{1}{12}$ 8	$15\frac{1}{16}$ 12
11.	9 $4\frac{2}{3}$	8 $2\frac{1}{4}$	16 $5\frac{3}{8}$	25 $7\frac{4}{5}$	34 $3\frac{1}{16}$
12.	7 $3\frac{1}{6}$	13 $2\frac{5}{8}$	8 $6\frac{3}{5}$	11 $8\frac{3}{10}$	23 $2\frac{9}{16}$
13.	10 $5\frac{3}{4}$	14 $7\frac{5}{6}$	12 $6\frac{7}{8}$	16 $3\frac{5}{12}$	32 $9\frac{7}{10}$
14.	4 $3\frac{1}{8}$	8 $5\frac{1}{12}$	5 $7\frac{3}{16}$	9 $9\frac{1}{10}$	2 $8\frac{3}{7}$



USING FRACTIONS AT THE STORE

When the cost of an article has a fraction of a cent in it, the store keeper charges the extra cent. For instance, if $3\frac{1}{2}$ pounds of fish cost $68\frac{1}{2}¢$, he would charge $69¢$.

1. Mary bought a pretty hair ribbon which was $\frac{5}{6}$ yd. long. How many inches long was Mary's ribbon?

2. Mrs. Thomas needed some cleaning fluid. How much did she pay for $\frac{3}{4}$ gal. at $35¢$ a gallon?

3. Ella's father brought home $1\frac{1}{2}$ lb. of grapes. If they cost $25¢$ a pound, how much did he pay for them?

4. Tom was looking around the store while his mother was shopping. He picked up a package of jelly. The weight printed on the package was $3\frac{3}{4}$ oz. How many ounces would 7 packages of jelly weigh?

5. Mrs. Curran wanted new drapes for her living room. If each drape was to be $2\frac{1}{4}$ yd. long, how much material would she have to buy for 8 drapes?

6. Mrs. Crowe bought $5\frac{1}{2}$ yd. of gingham to make dresses for her daughters. How much did she pay for it at $ .55 a yard?

7. Mr. Thorne bought a $6\frac{3}{8}$ lb. roast for Sunday's dinner. How much did he pay for it at $ .47 a pound?

8. Mrs. Cox bought $2\frac{1}{2}$ doz. eggs at $ .60 a dozen and $\frac{3}{4}$ lb. of cheese at $ .54 a pound. How much did she pay for both the eggs and the cheese?

KEEPING THE TOOLS SHARP

Add. Check each answer.

1.

3053	2625	4647	5231	8384
7174	8553	3962	4905	4662
8845	4266	5554	7429	4948
3263	9833	3620	5752	3451
5950	7497	6845	9204	2379
4336	7763	2512	4869	1580

Subtract. Check each answer.

2.

7929	9788	4281	3466	1974
7554	9499	2425	1867	976

3.

8600	7000	5050	3003	6103
5951	3913	2678	1805	6004

4.

17263	86202	64978	40604
7789	80638	57497	30606

Multiply. Check each answer.

5.

6103	8119	4581	3946	4912
3	5	8	9	7

6.

5020	3906	7306	684	458
4	7	6	80	30

7.

84	587	307	528	749	278
67	34	285	380	409	107

Divide. Check each answer.

8. $7\overline{)5373}$ $8\overline{)7298}$ $6\overline{)4140}$ $9\overline{)8147}$

9. $62\overline{)26412}$ $34\overline{)28441}$ $57\overline{)36765}$ $26\overline{)19672}$

10. $18\overline{)11640}$ $84\overline{)8375}$ $43\overline{)13158}$ $57\overline{)25671}$

KEEPING THE TOOLS SHARP

Add. Check each exercise. All answers must be in lowest terms.

1.	$4\frac{3}{8}$	$6\frac{2}{9}$	$8\frac{3}{4}$	$2\frac{3}{10}$	$10\frac{2}{3}$	$15\frac{5}{16}$
	$2\frac{1}{8}$	$7\frac{4}{9}$	$7\frac{3}{4}$	$9\frac{2}{5}$	$3\frac{5}{12}$	$6\frac{5}{8}$
2.	$8\frac{1}{2}$	$7\frac{1}{3}$	$4\frac{2}{3}$	$10\frac{3}{4}$	$8\frac{2}{5}$	$13\frac{5}{6}$
	$4\frac{1}{5}$	$9\frac{3}{8}$	$6\frac{1}{2}$	$5\frac{2}{3}$	$12\frac{3}{4}$	$14\frac{4}{5}$
3.	$2\frac{1}{6}$	$5\frac{1}{4}$	$7\frac{5}{6}$	$9\frac{7}{8}$	$13\frac{5}{6}$	$21\frac{7}{8}$
	$9\frac{3}{4}$	$8\frac{3}{10}$	$4\frac{5}{9}$	$9\frac{1}{6}$	$6\frac{3}{10}$	$15\frac{11}{12}$
4.	$4\frac{3}{10}$	$1\frac{5}{12}$	$5\frac{1}{2}$	$6\frac{5}{6}$	$9\frac{4}{5}$	$8\frac{1}{4}$
	$2\frac{1}{10}$	$5\frac{11}{12}$	$2\frac{5}{8}$	$1\frac{2}{3}$	$7\frac{1}{2}$	$5\frac{5}{16}$
	$3\frac{9}{10}$	$7\frac{1}{12}$	$8\frac{3}{4}$	$7\frac{1}{2}$	$6\frac{3}{10}$	$4\frac{7}{8}$

Subtract. Check each exercise. All answers must be in lowest terms.

5.	$\frac{7}{12}$	$\frac{1}{4}$	$\frac{9}{10}$	$\frac{2}{3}$	$\frac{5}{6}$	$\frac{1}{6}$
	$\frac{5}{12}$	$\frac{1}{16}$	$\frac{1}{5}$	$\frac{1}{4}$	$\frac{3}{5}$	$\frac{1}{8}$
6.	4	9	$7\frac{5}{6}$	$9\frac{7}{10}$	$10\frac{3}{8}$	$11\frac{1}{12}$
	$\frac{3}{5}$	$5\frac{2}{3}$	$3\frac{1}{6}$	$4\frac{3}{10}$	$2\frac{5}{8}$	$5\frac{7}{12}$
7.	$6\frac{1}{3}$	$8\frac{1}{2}$	$11\frac{1}{4}$	$15\frac{3}{8}$	$8\frac{1}{2}$	$9\frac{5}{6}$
	$3\frac{2}{9}$	$4\frac{5}{8}$	$2\frac{11}{12}$	$7\frac{9}{16}$	$5\frac{1}{3}$	$7\frac{4}{5}$
8.	$10\frac{1}{4}$	$12\frac{2}{5}$	$3\frac{5}{6}$	$8\frac{1}{6}$	$11\frac{1}{4}$	$21\frac{1}{8}$
	$6\frac{2}{3}$	$7\frac{3}{4}$	$1\frac{3}{4}$	$6\frac{5}{8}$	$3\frac{9}{10}$	$17\frac{7}{12}$
9.	$5\frac{3}{4}$	$13\frac{2}{5}$	$13\frac{1}{3}$	$14\frac{3}{8}$	$7\frac{3}{8}$	$16\frac{5}{6}$
	$1\frac{5}{16}$	$5\frac{7}{10}$	$9\frac{1}{5}$	$6\frac{4}{5}$	$4\frac{1}{10}$	$10\frac{8}{9}$

THE ROD

You have already learned four measures of length—the *inch*, the *foot*, the *yard* and the *mile*. These are called *units* of length.

1. What unit of length would you use to find the length of each of these? (a) the height of a door, (b) the distance between two towns, (c) the width of this page, (d) the width of the road.

To measure the length or width of a plot of land the mile is too long and it would take too much time if you used a yard stick. Of course, you could use a tape measure marked off in feet, but another unit of length, called the *rod*, is often used by farmers to measure such things as the distance across the front of a farm.

1 rod = $5\frac{1}{2}$ yd. or $16\frac{1}{2}$ ft.

2. To get a real idea of the length of a rod, draw a line on the board $16\frac{1}{2}$ ft. long.

3. Get a piece of string $16\frac{1}{2}$ ft. long and use it to find the length of the school grounds in rods.

4. How many yards are there in 5 rods?

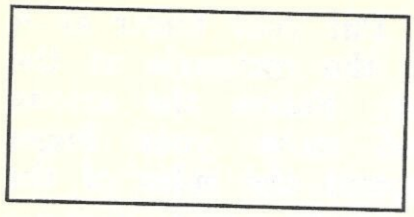
5. Farm fencing is sold in spools which have 40 rods of material. How many yards are there on a spool?

6. Engineers use a measure of length called a *chain* which is 4 rods long. How many feet in a chain?

Memorize this table:

12 inches (in.)	= 1 foot (ft.)
3 feet (ft.)	= 1 yard (yd.)
$5\frac{1}{2}$ yards (yd.)	= 1 rod (rd.)
$16\frac{1}{2}$ feet (ft.)	= 1 rod (rd.)
5280 feet (ft.)	= 1 mile (mi.)
320 rods (rd.)	= 1 mile (mi.)

THE RECTANGLE



The figure on the left is a *rectangle.*

The lines which mark off a rectangle are called the *sides* of the rectangle.

A rectangle has four sides and four square corners.

There are many things around us at all times which are shaped like rectangles.

1. Name things which are shaped like a rectangle in (a) your class room (b) in your home.

The longer side of a rectangle is called the *length* of the rectangle.

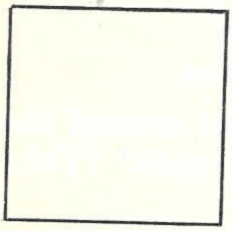
The shorter side of a rectangle is called the *width* of the rectangle.

The *length* and *width* of a rectangle are called the *dimensions* of the rectangle.

2. Your teacher will draw a rectangle on the board. Measure the length of the rectangle. Is there another line you could measure to find the length of the rectangle? What did you find out about the lengths of the rectangle?

3. Measure two lines either one of which will be the width of the rectangle. What did you find out about the widths of the rectangle?

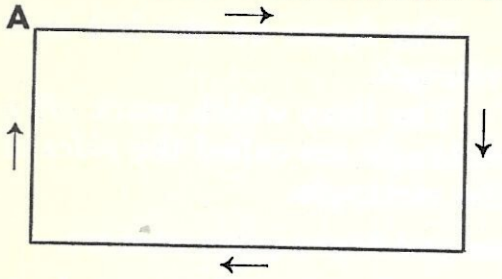
Remember: **The opposite sides of a rectangle are equal.**



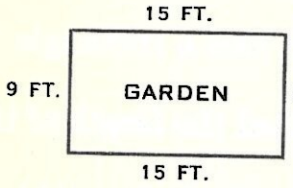
The figure on the left is a *square.* A square is a special kind of rectangle. It is a rectangle in which *all four sides are the same length.*

4. Name as many things as you can which are square shaped.

THE PERIMETER OF A RECTANGLE



Put your finger at A on the rectangle at the left. Follow the arrows and move your finger around the sides of the rectangle. This distance around the rectangle is called the *perimeter* of the rectangle.



Lillian has a garden which is 15 ft. long and 9 ft. wide. She is going to put a fence around it. How many feet of wire netting will she need?

To find how many feet of netting she needs we must find the *perimeter* of the garden. Look at the drawing of the garden.

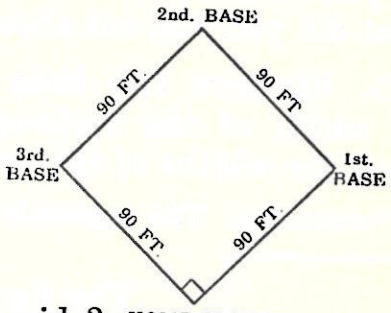
The distance around the garden is **15 ft. + 9 ft. + 15 ft. + 9 ft. = 48 ft.**

So Lillian needs 48 ft. of wire netting.

A short way to find the perimeter is shown on the right. Can you explain it?

$$\begin{array}{r} 15 \\ +9 \\ \hline 24 \\ \times 2 \\ \hline 48 \end{array}$$

1. A baseball diamond is really a square. The distance between bases is 90 ft. Yesterday Bill hit a home run. How far did he have to run?



2. What is the perimeter of a picture frame which is 22 in. long and 16 in. wide?

3. How much moulding is needed to put around the floor of a room which is 17 ft. long and 14 ft. wide? (Take off 6 ft. for door openings.)

4. Find the perimeter of your school desk.

5. What is the perimeter of your school room?

BUYING EASTER TOGS

Everyone likes to have some new clothing for Easter. Mr. and Mrs. Allan and their children Sally and Peter went down town to buy their Easter togs.

1. For Sally, they bought a dress for $8.50; a pair of stockings for $1.15; a purse for $1.79; and a pair of gloves for $1.35. How much did Sally's things cost?

2. For Peter, they bought a coat for $12.75; a shirt for $2.50; a tie for $ .75; and a pair of pants for $3.95. How much did Peter's things cost?

3. Peter said he needed socks too. How much did they pay for 3 pairs of socks at $1.29 a pair?

4. The only thing Mrs. Allan bought for herself was a hat which cost $5.95. How much change did she get from a $10 bill?

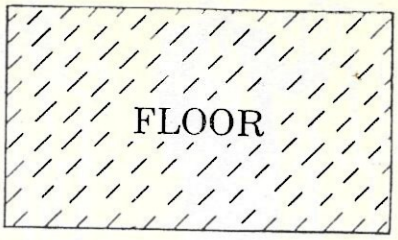
5. Mr. Allan needed a new top coat but he did not buy it that day. There were two coats he liked, however. The price of one coat was $43.25 and the price of the other was $39.60. What was the difference in the prices of the coats?

6. On the way home Mrs. Allan said they should buy an Easter lily for the dining room table. They bought a lily with 3 blooms on it. If each bloom cost $ .75, how much did they pay for the Easter lily?

THE MEANING OF AREA

The drawing on the right shows the surface of a floor. If you painted the floor you would cover its surface.

A word that means the same as "surface" is *area.*



Area means the amount of surface.

1. Take a sheet of paper and rub your hand over it to show what you mean by the area of the sheet of paper.

2. Use your hand to show what you mean by the area of the top of your desk.

3. What does the area of the blackboard mean?

THE SMALLEST UNIT OF AREA

If you want to measure how long anything is you must use a unit of length like the inch, or the foot or the yard, etc. *A unit of length must itself have length.*

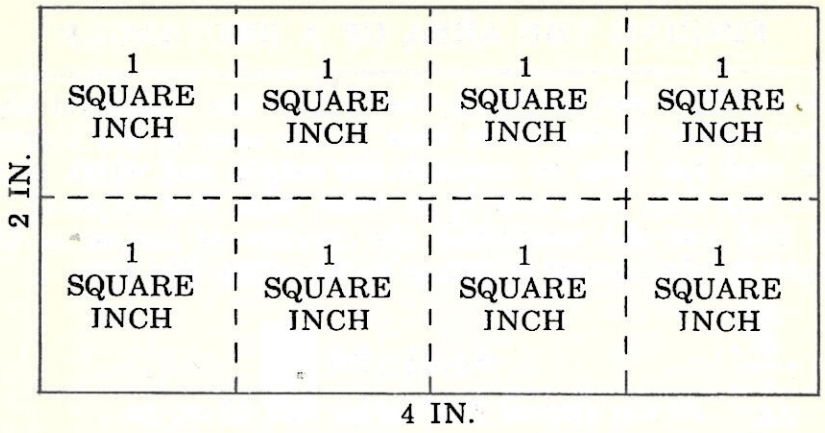
To measure weight you use a unit of weight like the ounce or pound. *A unit of weight must itself have weight.*

In the same way if you want *to measure area the unit you use must itself have area.*

The smallest common unit of area is the *square inch.* It is a square each of whose sides is 1 in. long. The important thing about a square inch is not its shape or the length of its sides but its *area* or surface. The important thing about the square inch is the shaded part which is the *area* of the square inch.

The abbreviation for *square inch* or *square inches* is *sq. in.*

Another year you will learn that a square inch does not have to be shaped like a square. What really counts is the amount of surface or area.



FINDING THE AREA OF A RECTANGLE

The rectangle above is 4 in. long and 2 in. wide. What is the area of the rectangle?

To find out we must find *how many square inches* it will take to cover the area of the rectangle.

The length of the rectangle is 4 in., so 4 square inches can be placed in the first row.

The width of the rectangle is 2 in., so there are 2 rows of square inches. Hence we have 4 sq. in. two times.

Then the area of the rectangle is 2×4 sq. in. $= 8$ sq. in.

The area of the rectangle above may be found in a shorter way. The *number* of inches in the length of the rectangle is 4; the *number* of inches in the width of the rectangle is 2. But $4 \times 2 = 8$. So the area of the rectangle, that is, the *number* of square inches in the area is 8.

The number of square inches in the area of a rectangle is found by multiplying the number of inches in the length by the number of inches in the width.

Remember that you do not multiply inches by inches. *You multiply the numbers.* The product will be the *number* of square inches in the area of the rectangle.

If the length of a rectangle is in inches and the width in inches the area will be expressed in square inches.

FINDING THE AREA OF A RECTANGLE

When Millie was studying about area she wondered how many square inches there were in the area of her blotter. She used her ruler to measure the length and width of it. If it was 8 in. long and $3\frac{1}{2}$ in. wide, what was its area? To find out she multiplied the *number* of inches in the length by the *number* of inches in the width, like this:

$$3\tfrac{1}{2}$$
$$\underline{8}$$
$$4$$
$$24$$
$$\underline{28}$$

$$8 \times 3\tfrac{1}{2} = 28$$

So the area of the blotter was 28 sq. in.

Find the areas of rectangles which have these dimensions:

1. 9 in. long and 4 in. wide **2.** 11 in. long and 5 in. wide

3. 15 in. long and 8 in. wide **4.** 17 in. long and 7 in. wide

5. 14 in. long and 12 in. wide **6.** 19 in. long and 13 in. wide

7. 10 in. long and $6\frac{1}{2}$ in. wide **8.** $9\frac{1}{4}$ in. long and 8 in. wide

9. 6 in. long and $\frac{3}{4}$ in. wide **10.** $15\frac{3}{8}$ in. long and 9 in. wide

11. Measure the length and width of a sheet of your note paper and find its area.

12. How many inches long is the top of your desk? How many inches wide is the top of your desk? What is the area of the top of your desk?

13. Joe's handkerchief is shaped like a square. It is 16 in. long and 16 in. wide. How many square inches are there in the area of Joe's handkerchief?

14. What is the area of a post card which is 5 in. long and $3\frac{1}{2}$ in. wide?

15. Edgar liked to play checkers. At manual training class he made a checker board for himself. If it was 12 in. long and 12 in. wide, what was the area of the board?

KEEPING THE TOOLS SHARP

Add. Check each answer.

1.

6976	5952	7697	5855	9446
8877	7798	9985	9848	6076
5343	7604	3706	3499	7354
9260	6997	8449	6404	6055
5982	4505	5666	3825	8238
8590	3426	4802	9970	9197

Subtract. Check each answer.

2.

4837	1741	5752	6235	1474
4564	1358	1838	4369	889

3.

5400	8000	7070	6004	3101
3624	4561	5496	3005	3007

4.

12823	67608	82727	70703
2894	60649	73292	40706

Multiply. Check each answer.

5.

4012	8115	4960	2478	6712
4	7	6	5	8

6.

7020	5708	3705	436	387
3	7	8	40	50

7.

62	219	402	519	582	835
45	29	367	260	108	509

Divide. Check each answer.

8. $6\overline{)3426}$ $7\overline{)1496}$ $8\overline{)5120}$ $5\overline{)4027}$

9. $81\overline{)44388}$ $24\overline{)17904}$ $48\overline{)14218}$ $56\overline{)41953}$

10. $19\overline{)9829}$ $65\overline{)6462}$ $74\overline{)15392}$ $35\overline{)30174}$

KEEPING THE TOOLS SHARP

Add. All answers must be in lowest terms.

1.	$1\frac{3}{8}$	$4\frac{2}{5}$	$2\frac{3}{4}$	$5\frac{7}{10}$	$8\frac{1}{8}$	$7\frac{5}{12}$
	$2\frac{3}{8}$	$3\frac{1}{5}$	$6\frac{3}{4}$	$4\frac{9}{10}$	$6\frac{1}{4}$	$5\frac{1}{3}$
2.	$4\frac{1}{2}$	$6\frac{2}{3}$	$9\frac{7}{10}$	$8\frac{1}{2}$	$10\frac{2}{5}$	$12\frac{1}{3}$
	$8\frac{13}{16}$	$7\frac{5}{6}$	$5\frac{2}{5}$	$8\frac{1}{3}$	$6\frac{1}{4}$	$2\frac{7}{10}$
3.	$2\frac{1}{3}$	$5\frac{3}{4}$	$11\frac{3}{10}$	$17\frac{3}{4}$	$19\frac{5}{8}$	$12\frac{5}{6}$
	$9\frac{7}{8}$	$8\frac{2}{3}$	$6\frac{1}{4}$	$4\frac{5}{6}$	$13\frac{5}{12}$	$27\frac{7}{8}$

Subtract Check each exercise.

4.	$3\frac{3}{4}$	$6\frac{7}{10}$	$7\frac{3}{8}$	$9\frac{3}{16}$	$8\frac{5}{6}$	$4\frac{3}{4}$
	$1\frac{1}{4}$	$2\frac{3}{10}$	$4\frac{5}{8}$	$5\frac{9}{16}$	$7\frac{2}{3}$	$3\frac{5}{16}$
5.	$8\frac{1}{2}$	$3\frac{2}{5}$	$11\frac{1}{16}$	$10\frac{1}{3}$	$13\frac{1}{2}$	$12\frac{2}{5}$
	$4\frac{7}{8}$	$2\frac{7}{10}$	$7\frac{5}{12}$	$4\frac{1}{4}$	$8\frac{3}{5}$	$9\frac{2}{3}$
6.	$5\frac{1}{2}$	$14\frac{1}{3}$	$17\frac{3}{4}$	$15\frac{5}{6}$	$22\frac{1}{10}$	$35\frac{7}{10}$
	$2\frac{2}{3}$	$7\frac{7}{8}$	$9\frac{1}{6}$	$6\frac{3}{8}$	$8\frac{3}{4}$	$17\frac{5}{6}$

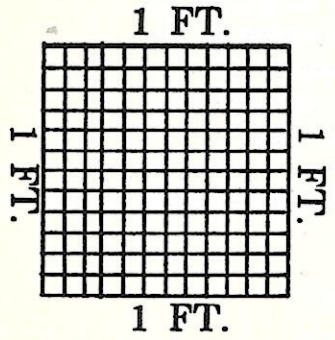
Multiply. Check each exercise.

7.	$5\times\frac{1}{2}$	$3\times\frac{3}{4}$	$6\times\frac{5}{8}$	$15\times\frac{3}{10}$
8.	$3\times\frac{3}{16}$	$4\times\frac{1}{6}$	$8\times\frac{1}{2}$	$12\times\frac{2}{3}$
9.	$\frac{3}{10}\times 20$	$\frac{7}{8}\times 24$	$\frac{3}{5}\times 11$	$\frac{1}{8}\times 23$
10.	$\frac{5}{6}\times 16$	$\frac{3}{16}\times 20$	$\frac{1}{8}\times 6$	$\frac{5}{12}\times 2$

11.	$7\frac{1}{2}$	$9\frac{3}{8}$	$10\frac{3}{4}$	$11\frac{2}{9}$	$13\frac{1}{10}$
	5	7	6	9	5
12.	12	25	16	20	5
	$5\frac{1}{4}$	$8\frac{3}{5}$	$7\frac{2}{3}$	$9\frac{5}{8}$	$2\frac{1}{6}$

LARGER UNITS OF AREA

Besides the square inch there are larger units of area to measure larger areas than those measured with the square inch. Two of these larger units of area are the *square foot (sq. ft.)* and the *square yard (sq. yd.)*



The figure on the left represents a *square foot.* A square foot is a square which has each of its sides 1 foot long. It would be used to measure a large area like the area of a floor.

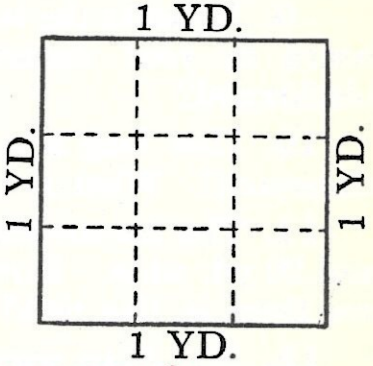
Your teacher will draw a real square foot on the board.

If the dimensions of a rectangle are in feet the area will be in square feet.

The square foot above is divided into square inches. Note that there are 12 sq. in. in each row and that there are 12 rows, so in 1 sq. ft. there are 12×12 sq. in. $= 144$ sq. in.

1 square foot (sq. ft.) = 144 square inches (sq. in.)

The figure on the right represents a *square yard* (sq. yd.). A square yard is a square which has each of its sides 1 yard long. It would be used to measure a large area like the area of a sidewalk.



Your teacher will draw a real square yard on the board.

If the dimensions of a rectangle are in yards the area will be in square yards.

The square yard on the right is divided into square feet. There are 3 square feet in each row and there are 3 rows so in 1 sq. yd. there are 3×3 sq. ft. $= 9$ sq. ft.

1 square yard (sq. yd.) = 9 square feet (sq. ft.)

USING LARGER UNITS OF AREA

Neil had a vegetable garden of his own which was 25 ft. long and 12 feet wide. Last Saturday Neil spaded his garden. How many square feet did Neil spade?

$$\begin{array}{r} 25 \\ 12 \\ \hline 50 \\ 25 \\ \hline 300 \end{array}$$

To find out we must find the *area* of the garden.
The *number* of feet in the length is 25.
The *number* of feet in the width is 12.
Multiply 25 by 12 as shown.
The area of the garden is 300 sq. ft.
So Neil spaded 300 square feet.

Find the areas of rectangles which have these dimensions:

1. 8 ft. long and 6 ft. wide.
2. 9 yd. long and 7 yd. wide.
3. $14\frac{1}{2}$ yd. long and 5 yd. wide.
4. 21 ft. long and 13 ft. wide.
5. 37 yd. long and 14 yd. wide.
6. 75 ft. long and $7\frac{1}{4}$ ft. wide.
7. 240 ft. long and 65 ft. wide.
8. 126 yd. long and 43 yd. wide.
9. Measure the length and width of the front blackboard in your classroom. What is the area of the blackboard?
10. How long is your classroom? How wide is your classroom? What is the area of your classroom?
11. The ice-surface of a hockey rink is 60 yd. long and 20 yd. wide. How many square yards of ice-surface are there in this rink?
12. Mr. Allen wants to sod his lawn which is 40 ft. long and 27 ft. wide. How many square feet of sod will he need?
13. After the frost was out of the ground, a section of the highway, 48 yd. long and 7 yd. wide, had to be paved. How many square yards of highway were paved?

BE CAREFUL WHEN FINDING AREAS LIKE THESE

Mrs. Connor wanted to cover her kitchen floor with linoleum. The floor was 5 yd. long and 12 ft. wide. How many square yards of linoleum did she need?

To find out we must find the *area* of the floor.

The length of the floor is 5 *yd.* and the width is 12 *ft.*

Remember: *Before you find the area, both the length and the width must be in the same unit of measurement.*

Change 12 ft. to yards. 12 ft. = 4 yd.

Then the number of yards in the length is 5, and the number of yards in the width is 4.

Multiply 5 by 4 as shown.

$$\begin{array}{r} 5 \\ \times 4 \\ \hline 20 \end{array}$$

The area of the floor is 20 sq. yd.

So, Mrs. Connor needed 20 square yards of linoleum.

1. Mrs. Munroe made a lace tablecloth 9 ft. long and 2 yd. wide. How many square yards of tablecloth did she make?

2. Ella hooked a mat which was 4 feet long and 24 in. wide. How many square feet were in Ella's mat?

3. Jack measured the calendar in the kitchen. It was 1 ft. long and 9 in. wide. How many square inches were there in the area of the calendar?

4. How many square inches are there in 3 square feet?

5. How many square feet in 11 square yards?

6. How many square yards in 126 square feet?

7. How much will a strip of carpet, 6 yards long and 36 in. wide, cost at $1.75 a square yard?

8. Frank's bedroom is 12 ft. long and 8 ft. wide. How many square yards are there in the area of the floor?

9. Sally does needle-point. How many yards of yarn does she use in making a picture 9 in. long and 7 in. wide if 3 yards of yarn are used for each square inch?

PICKING STRAWBERRIES

Strawberries are delicious. Many people have small strawberry patches for their own use whilst others grow many strawberries for the market.

1. Mrs. Roy was going to start a strawberry patch in her garden. She paid \$2.50 for 50 "Ever-bearing" plants. How much did each plant cost?

2. Mr. Gill raises strawberries for the market. He hires boys and girls to pick the strawberries and pays them $3\frac{1}{2}¢$ for each box picked. If Tony picked 138 boxes in one day, how much did he earn?

3. Mr. Gill sells his strawberries by the crate. If there are 27 boxes in a crate, how many crates are needed for 1080 boxes?

4. If he charges \$ .35 a box for his strawberries, how much will he get for a crate which holds 27 boxes?

5. Last year Mr. Gill had an acre in strawberries from which he got 4200 boxes. After all expenses were were paid he made $15\frac{1}{2}¢$ a box. How much did he make on the acre of strawberries?

6. A grocer paid \$10.20 for a crate of strawberries in which there were 27 boxes. If he sold the strawberries at \$ .42 a box, how much profit did he make on the crate?

KEEPING THE TOOLS SHARP

Add. All answers must be in lowest terms.

1.	$4\frac{1}{6}$	$3\frac{1}{10}$	$7\frac{4}{5}$	$8\frac{7}{8}$	$5\frac{2}{3}$	$7\frac{11}{16}$
	$1\frac{1}{6}$	$5\frac{7}{10}$	$2\frac{3}{5}$	$4\frac{3}{8}$	$9\frac{1}{6}$	$8\frac{5}{8}$
2.	$6\frac{2}{3}$	$4\frac{3}{4}$	$9\frac{1}{2}$	$10\frac{1}{3}$	$14\frac{2}{5}$	$15\frac{7}{8}$
	$5\frac{5}{12}$	$8\frac{3}{8}$	$3\frac{9}{10}$	$2\frac{1}{4}$	$6\frac{1}{2}$	$5\frac{1}{3}$
3.	$8\frac{1}{2}$	$7\frac{4}{5}$	$11\frac{1}{6}$	$16\frac{3}{4}$	$31\frac{9}{10}$	$26\frac{3}{10}$
	$9\frac{2}{3}$	$6\frac{3}{4}$	$8\frac{3}{8}$	$4\frac{7}{10}$	$15\frac{1}{6}$	$8\frac{7}{8}$

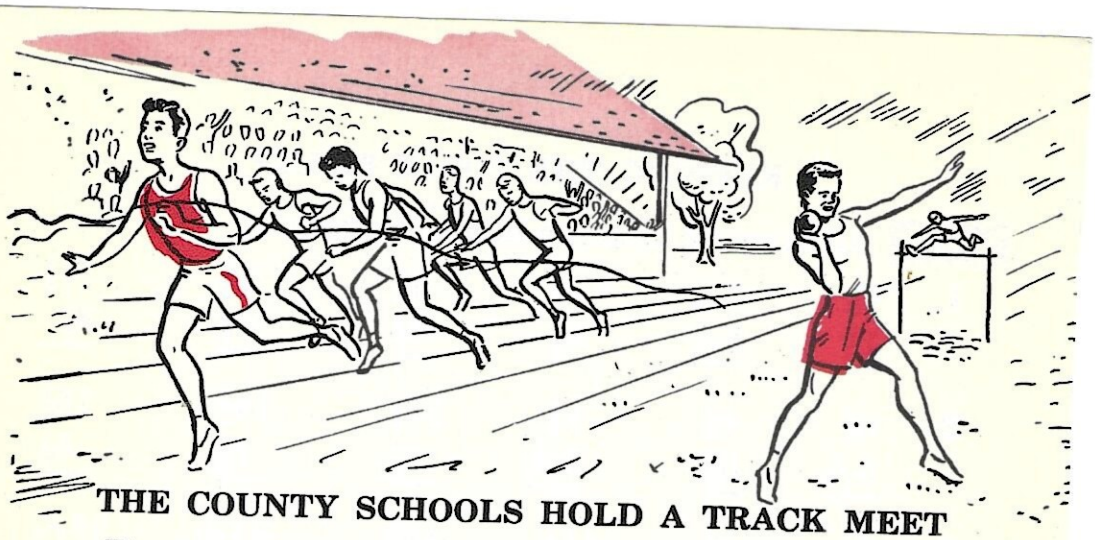
Subtract. Check each exercise.

4.	$5\frac{3}{5}$	$6\frac{7}{8}$	$9\frac{1}{4}$	$8\frac{3}{10}$	$11\frac{1}{2}$	$12\frac{3}{4}$
	$2\frac{1}{5}$	$1\frac{1}{8}$	$4\frac{3}{4}$	$3\frac{7}{10}$	$5\frac{1}{16}$	$8\frac{1}{12}$
5.	$7\frac{1}{8}$	$8\frac{5}{12}$	$10\frac{3}{8}$	$14\frac{1}{2}$	$12\frac{1}{5}$	$17\frac{2}{5}$
	$4\frac{3}{4}$	$3\frac{5}{6}$	$2\frac{7}{16}$	$7\frac{1}{3}$	$5\frac{1}{2}$	$9\frac{3}{4}$
6.	$11\frac{5}{6}$	$13\frac{2}{3}$	$17\frac{1}{8}$	$15\frac{5}{6}$	$14\frac{3}{10}$	$24\frac{3}{4}$
	$5\frac{3}{5}$	$4\frac{3}{4}$	$8\frac{1}{6}$	$6\frac{3}{4}$	$5\frac{5}{6}$	$11\frac{7}{10}$

Multiply. Check each exercise.

7.	$4\times\frac{2}{3}$	$6\times\frac{3}{5}$	$14\times\frac{1}{6}$	$10\times\frac{7}{8}$
8.	$2\times\frac{3}{8}$	$6\times\frac{3}{10}$	$8\times\frac{3}{4}$	$24\times\frac{1}{12}$
9.	$\frac{1}{2}\times14$	$\frac{5}{16}\times48$	$\frac{2}{3}\times17$	$\frac{7}{8}\times9$
10.	$\frac{5}{6}\times18$	$\frac{7}{12}\times22$	$\frac{1}{10}\times8$	$\frac{3}{16}\times4$

11.	$8\frac{2}{3}$	$9\frac{5}{8}$	$12\frac{7}{12}$	$32\frac{3}{4}$	$14\frac{1}{16}$
	4	6	8	4	8
12.	18	40	19	22	8
	$3\frac{1}{6}$	$2\frac{3}{10}$	$4\frac{4}{5}$	$6\frac{1}{8}$	$7\frac{1}{12}$



THE COUNTY SCHOOLS HOLD A TRACK MEET

Every year Queens County schools hold a track meet. For weeks before the "meet" boys practise hard at running and jumping. Finally the day of the meet comes and the teams compete for the cup which goes to the school whose team makes top score.

1. Bobby won the 100-yard dash for boys under 14 in $15\frac{1}{5}$ sec. Alex won the 100-yard dash for older boys in $13\frac{4}{5}$ sec. How many seconds faster did Alex run the 100 yards than Bobby?

2. Last year there was a potato race for the girls. Elsie gathered the potatoes in $34\frac{1}{2}$ sec. and Jane gathered them in $37\frac{3}{10}$ sec. How much faster did Elsie gather the potatoes?

3. In the running broad jump Leo jumped $11\frac{1}{4}$ ft. and Ray jumped $10\frac{3}{4}$ ft. How much farther did Leo jump than Ray?

4. In the running high jump Steve jumped $4\frac{1}{2}$ ft. and Owen jumped $4\frac{5}{6}$ ft. How much higher did Owen jump than Steve?

5. In the 12-pound shot put event Bob put the shot $19\frac{1}{4}$ ft. on his first trial and $20\frac{1}{2}$ ft. on the second trial. How much farther did he put the shot the second time?

6. A world's record for men for the 100-yard dash is $9\frac{2}{5}$ sec. If a runner covers 100 yards in $12\frac{1}{10}$ sec., how much slower is this than the world's record?

KEEPING THE TOOLS SHARP

Add. Check each answer.

1.

4775	9766	6869	9651	9875
8394	1090	2772	5384	3609
1657	6351	9406	6196	6815
6772	7832	4558	4818	1732
3058	5088	6823	5527	8406
4471	3241	2690	9854	3847

Subtract. Check each answer.

2.

2568	3625	9597	9351	1742
2292	3268	4738	7954	979

3.

7500	4000	6030	5001	1101
5836	2842	4965	1104	1009

4.

15322	24504	41657	50405
5564	20819	37293	30308

Multiply. Check each answer.

5.

9032	7112	4780	2578	6819
3	8	9	6	4

6.

3020	2904	7502	945	469
4	6	9	50	60

7.

39	316	509	726	793	639
28	19	374	270	506	408

Divide. Check each answer.

8. $8\overline{)4696}$ $7\overline{)6395}$ $9\overline{)4230}$ $6\overline{)3645}$

9. $43\overline{)10879}$ $74\overline{)35412}$ $69\overline{)36856}$ $38\overline{)13571}$

10. $17\overline{)11480}$ $34\overline{)3284}$ $65\overline{)15619}$ $58\overline{)23606}$

KEEPING THE TOOLS SHARP

Add. All answers must be in lowest terms.

1.	$2\frac{3}{10}$	$6\frac{5}{12}$	$4\frac{5}{8}$	$8\frac{7}{16}$	$7\frac{1}{8}$	$9\frac{5}{6}$
	$3\frac{3}{10}$	$1\frac{1}{12}$	$5\frac{7}{8}$	$3\frac{11}{16}$	$7\frac{3}{4}$	$2\frac{1}{2}$
2.	$3\frac{1}{2}$	$5\frac{3}{16}$	$8\frac{7}{12}$	$9\frac{1}{5}$	$10\frac{1}{4}$	$12\frac{2}{3}$
	$7\frac{3}{4}$	$9\frac{7}{8}$	$7\frac{5}{6}$	$9\frac{1}{2}$	$3\frac{2}{3}$	$2\frac{5}{8}$
3.	$6\frac{2}{3}$	$4\frac{1}{6}$	$11\frac{1}{4}$	$13\frac{5}{6}$	$22\frac{5}{6}$	$16\frac{7}{10}$
	$8\frac{1}{2}$	$9\frac{4}{5}$	$5\frac{1}{6}$	$7\frac{4}{9}$	$15\frac{3}{8}$	$39\frac{5}{8}$

Subtract. Check each exercise.

4.	$3\frac{5}{6}$	$5\frac{9}{16}$	$7\frac{1}{3}$	$9\frac{3}{10}$	$13\frac{3}{4}$	$15\frac{5}{6}$
	$1\frac{1}{6}$	$2\frac{3}{16}$	$4\frac{2}{3}$	$5\frac{7}{10}$	$7\frac{1}{8}$	$4\frac{5}{12}$
5.	$4\frac{1}{2}$	$8\frac{2}{9}$	$6\frac{1}{4}$	$10\frac{1}{2}$	$16\frac{2}{5}$	$18\frac{1}{2}$
	$2\frac{9}{10}$	$3\frac{2}{3}$	$1\frac{5}{16}$	$4\frac{1}{3}$	$7\frac{1}{3}$	$9\frac{4}{5}$
6.	$12\frac{2}{3}$	$14\frac{3}{5}$	$17\frac{5}{6}$	$11\frac{3}{4}$	$10\frac{1}{6}$	$29\frac{1}{9}$
	$6\frac{3}{4}$	$9\frac{5}{6}$	$8\frac{1}{8}$	$3\frac{3}{10}$	$8\frac{3}{4}$	$17\frac{5}{6}$

Multiply. Check each exercise.

7.	$11\times\frac{1}{6}$	$5\times\frac{5}{8}$	$10\times\frac{3}{4}$	$8\times\frac{7}{10}$
8.	$2\times\frac{5}{12}$	$3\times\frac{5}{16}$	$12\times\frac{1}{2}$	$9\times\frac{2}{3}$
9.	$\frac{5}{6}\times18$	$\frac{3}{5}\times45$	$\frac{1}{4}\times19$	$\frac{2}{5}\times13$
10.	$\frac{3}{4}\times14$	$\frac{5}{8}\times10$	$\frac{1}{12}\times8$	$\frac{3}{8}\times2$

11.	$10\frac{5}{6}$	$13\frac{3}{10}$	$17\frac{7}{8}$	$46\frac{3}{5}$	$51\frac{1}{12}$
	7	8	6	5	4
12.	18	48	13	14	12
	$6\frac{1}{2}$	$3\frac{5}{16}$	$4\frac{5}{6}$	$7\frac{3}{4}$	$5\frac{1}{16}$

TWO-STEP PROBLEMS

1. Mrs. Rice bought 4 lb. of lamb at $ .42 a pound. How much change did she get from a $5 bill?

2. Ella's mother sent her to the grocery store to buy $3\frac{1}{2}$ lb. of cheese at $ .40 a pound and a package of breakfast food for $ .29. How much did she pay the grocer?

3. Fred paid 24¢ for 6 oranges. At the same rate how much would he have to pay for 10 oranges?

4. Mr. Gregg sold 5 dressed hogs to a market. The weights of the hogs were: 162 lb., 174 lb., 158 lb., 165 lb., and 176 lb. What was the average weight of the hogs?

5. Mr. Thomas, the bookseller, received 16 boxes of birthday cards with 24 cards in each box. If he sold the cards for 5¢ each, how much did he get for them?

6. Sammy is saving his money to buy a bicycle which will cost $42.50. He has saved $2.25 each week for the last 12 weeks. How much more must he save before he can buy the bicycle?

7. Mrs. Cann had a rope which was $18\frac{1}{2}$ ft. long. She cut off $5\frac{1}{4}$ ft. to make a skipping rope for Tina and $6\frac{3}{8}$ ft. to make a skipping rope for Paul. How much of it was left?

8. Bill worked 26 days last month at the mill and earned $68.90. Bill's father earns $6.25 a day. How much more does Bill's father earn a day than Bill?

9. The area of Mr. Thompson's garden is 3600 sq. ft. His neighbour's garden is 65 ft. long and 25 ft. wide. How much greater is the area of Mr. Thompson's garden?

10. Mr. Murphy drove a distance of 280 mi. at an average speed of 35 mi. an hour. Mr. Allen drove the same distance in $7\frac{1}{2}$ hr. How much longer did Mr. Murphy take to drive the distance?

KEEPING THE TOOLS SHARP

Add. Check each answer.

1.

53	24	86	28	75	59	65
84	85	37	66	48	97	89
32	39	74	84	93	26	53
60	61	59	55	60	54	67
56	70	36	99	72	39	42
47	56	14	59	30	82	87

2.

346	637	252	873	495	617
953	584	693	529	768	679
205	627	425	852	447	801
529	954	980	605	394	230
702	635	436	340	256	813
650	704	283	204	982	906

3.

205	74	46	394	185	768
54	547	52	446	72	159
373	308	876	87	890	63
816	92	488	206	43	38
770	170	53	575	684	347
83	44	837	59	40	536

4.

5479	8167	3246	1468	2904
8823	5376	8709	9945	4535
3406	6410	7854	8732	6268
7852	4964	5703	6309	3081
3498	8079	7215	9524	8448
2323	7262	4744	6703	2930

5.

$95.05	$ 6.47	$34.56	$16.25	$ 8.48
41.21	14.07	1.25	33.37	74.56
4.87	62.83	67.96	9.70	4.02
58.36	9.38	59.75	2.58	46.98
4.22	41.05	3.86	94.05	84.37
18.70	70.96	65.99	75.38	9.69

KEEPING THE TOOLS SHARP

Subtract. Check each answer.

1.	6984	3675	2984	8762	1183
	2352	1640	2504	3735	937
2.	1624	1258	1429	1373	6379
	816	478	562	790	4656
3.	4485	8741	9674	6247	3622
	3745	2487	7579	2352	2860
4.	7452	3464	5428	9375	5281
	3673	1498	3959	8896	4882
5.	64341	74252	47475	26283	32634
	14656	59569	29878	17397	24649
6.	75364	12778	92452	57188	11924
	31935	5486	41813	26269	9780
7.	53642	82285	26443	83719	36467
	26473	57946	18393	79586	28758
8.	69270	57508	72200	48005	85000
	14633	39756	27147	29815	25526
9.	85128	35213	71416	41118	21610
	33255	26784	31847	19629	15937
10.	78106	43010	64101	81102	73101
	31040	39804	46003	25078	47036

KEEPING THE TOOLS SHARP

Multiply. Check each answer.

1.	531 × 3	604 × 2	617 × 5	306 × 7	923 × 4	803 × 6
2.	971 × 8	280 × 5	461 × 9	1702 × 4	2510 × 6	4932 × 3
3.	379 × 2	467 × 6	945 × 8	864 × 4	725 × 7	439 × 5
4.	5786 × 3	2984 × 7	7493 × 5	2846 × 8	3285 × 9	1948 × 7
5.	3548 × 2	2916 × 6	9523 × 4	4825 × 3	1309 × 5	2806 × 8
6.	61 × 30	86 × 50	73 × 60	32 × 14	71 × 36	43 × 28
7.	74 × 53	93 × 76	96 × 34	85 × 65	58 × 49	79 × 68
8.	741 × 400	756 × 700	528 × 300	213 × 153	302 × 124	615 × 251
9.	670 × 485	859 × 364	950 × 728	804 × 576	976 × 693	287 × 102
10.	654 × 305	716 × 607	408 × 208	942 × 706	937 × 804	907 × 509

KEEPING THE TOOLS SHARP

Divide. Check each answer.

1.	$3\overline{)1422}$	$5\overline{)1630}$	$4\overline{)2471}$	$7\overline{)3962}$	$6\overline{)4293}$
2.	$9\overline{)2175}$	$8\overline{)4096}$	$6\overline{)5254}$	$5\overline{)2735}$	$7\overline{)5098}$
3.	$4\overline{)1560}$	$6\overline{)2762}$	$9\overline{)3154}$	$8\overline{)5840}$	$5\overline{)4052}$
4.	$7\overline{)2128}$	$3\overline{)2720}$	$4\overline{)3216}$	$8\overline{)4873}$	$9\overline{)8157}$
5.	$40\overline{)360}$	$50\overline{)352}$	$72\overline{)288}$	$64\overline{)192}$	$93\overline{)664}$
6.	$34\overline{)238}$	$81\overline{)350}$	$43\overline{)316}$	$62\overline{)558}$	$51\overline{)445}$
7.	$94\overline{)564}$	$73\overline{)596}$	$23\overline{)119}$	$84\overline{)504}$	$65\overline{)275}$
8.	$42\overline{)672}$	$34\overline{)859}$	$72\overline{)2520}$	$63\overline{)2686}$	$52\overline{)4398}$
9.	$23\overline{)621}$	$35\overline{)1586}$	$24\overline{)1344}$	$65\overline{)1843}$	$34\overline{)1920}$
10.	$38\overline{)252}$	$27\overline{)191}$	$46\overline{)1210}$	$59\overline{)4291}$	$25\overline{)1625}$
11.	$28\overline{)198}$	$69\overline{)347}$	$37\overline{)1591}$	$58\overline{)4176}$	$27\overline{)1998}$
12.	$14\overline{)1218}$	$13\overline{)611}$	$17\overline{)1619}$	$15\overline{)1026}$	$18\overline{)1536}$
13.	$45\overline{)405}$	$24\overline{)2136}$	$82\overline{)8193}$	$34\overline{)3034}$	$23\overline{)2047}$
14.	$31\overline{)7482}$	$63\overline{)9828}$	$25\overline{)6825}$	$76\overline{)9763}$	$58\overline{)8454}$
15.	$47\overline{)12220}$	$85\overline{)32342}$	$67\overline{)30175}$	$29\overline{)15382}$	
16.	$54\overline{)11178}$	$78\overline{)23885}$	$19\overline{)9682}$	$25\overline{)22675}$	
17.	$3\overline{)\$26.01}$	$7\overline{)\$45.50}$	$6\overline{)\$12.18}$	$19\overline{)\$42.75}$	
18.	$71\overline{)\$248.50}$	$39\overline{)\$9.75}$	$47\overline{)\$15.04}$	$12\overline{)\$13.44}$	

KEEPING THE TOOLS SHARP

Add. Check each answer.

1.	$\frac{1}{5}$ $\frac{3}{5}$	$\frac{3}{8}$ $\frac{7}{8}$	$\frac{5}{12}$ $\frac{11}{12}$	$4\frac{7}{10}$ $3\frac{1}{10}$	$1\frac{3}{4}$ $7\frac{3}{4}$	$2\frac{9}{16}$ $8\frac{11}{16}$
2.	$\frac{1}{2}$ $\frac{3}{8}$	$\frac{3}{10}$ $\frac{2}{5}$	$\frac{2}{3}$ $\frac{5}{6}$	$\frac{1}{2}$ $\frac{11}{12}$	$\frac{7}{16}$ $\frac{5}{8}$	$\frac{5}{12}$ $\frac{3}{4}$
3.	$2\frac{1}{12}$ $1\frac{5}{6}$	$5\frac{3}{8}$ $4\frac{1}{4}$	$3\frac{9}{16}$ $8\frac{1}{2}$	$1\frac{4}{5}$ $3\frac{7}{10}$	$6\frac{3}{4}$ $2\frac{13}{16}$	$4\frac{7}{12}$ $9\frac{2}{3}$
4.	$\frac{2}{3}$ $\frac{1}{4}$	$\frac{1}{2}$ $\frac{2}{5}$	$\frac{1}{3}$ $\frac{7}{8}$	$\frac{1}{2}$ $\frac{2}{3}$	$\frac{3}{5}$ $\frac{3}{4}$	$\frac{2}{3}$ $\frac{7}{10}$
5.	$7\frac{1}{2}$ $2\frac{1}{3}$	$1\frac{1}{6}$ $10\frac{3}{5}$	$12\frac{3}{4}$ $4\frac{1}{3}$	$6\frac{4}{5}$ $15\frac{1}{2}$	$9\frac{2}{3}$ $7\frac{5}{8}$	$11\frac{5}{6}$ $3\frac{4}{5}$
6.	$\frac{1}{4}$ $\frac{3}{10}$	$\frac{3}{8}$ $\frac{1}{6}$	$\frac{3}{4}$ $\frac{5}{6}$	$\frac{7}{12}$ $\frac{7}{8}$	$\frac{5}{8}$ $\frac{7}{10}$	$\frac{9}{10}$ $\frac{5}{6}$
7.	$2\frac{1}{6}$ $9\frac{3}{4}$	$8\frac{1}{10}$ $1\frac{3}{8}$	$12\frac{3}{4}$ $2\frac{7}{10}$	$7\frac{5}{6}$ $16\frac{3}{8}$	$13\frac{15}{16}$ $19\frac{1}{6}$	$22\frac{5}{12}$ $5\frac{7}{10}$
8.	$\frac{4}{10}$ $\frac{1}{10}$ $\frac{3}{10}$	$\frac{5}{12}$ $\frac{1}{3}$ $\frac{1}{6}$	$\frac{1}{2}$ $\frac{3}{10}$ $\frac{4}{5}$	$\frac{5}{6}$ $\frac{1}{2}$ $\frac{2}{3}$	$\frac{3}{8}$ $\frac{5}{6}$ $\frac{1}{4}$	$\frac{1}{2}$ $\frac{7}{8}$ $\frac{1}{6}$
9.	$2\frac{3}{16}$ $6\frac{5}{16}$ $1\frac{7}{16}$	$9\frac{1}{8}$ $3\frac{1}{4}$ $5\frac{1}{2}$	$1\frac{3}{4}$ $7\frac{1}{10}$ $4\frac{4}{5}$	$5\frac{1}{6}$ $6\frac{3}{4}$ $8\frac{2}{3}$	$3\frac{1}{2}$ $7\frac{5}{6}$ $11\frac{3}{8}$	$12\frac{5}{8}$ $5\frac{7}{12}$ $6\frac{1}{4}$

KEEPING THE TOOLS SHARP

Subtract. Check each answer.

1.	$\frac{5}{6}$ $\frac{1}{6}$	$\frac{9}{10}$ $\frac{3}{10}$	$7\frac{11}{12}$ $2\frac{5}{12}$	$6\frac{7}{8}$ $3\frac{1}{8}$	$9\frac{5}{8}$ $5\frac{3}{8}$	$11\frac{13}{16}$ $4\frac{5}{16}$
2.	5 $\frac{1}{3}$	3 $\frac{4}{5}$	7 $\frac{5}{16}$	9 $3\frac{1}{4}$	15 $6\frac{7}{12}$	11 $5\frac{3}{8}$
3.	$2\frac{1}{5}$ $\frac{3}{5}$	$5\frac{1}{4}$ $\frac{3}{4}$	$6\frac{3}{8}$ $\frac{7}{8}$	$4\frac{3}{10}$ $\frac{7}{10}$	$7\frac{2}{5}$ $\frac{4}{5}$	$3\frac{3}{16}$ $\frac{11}{16}$
4.	$7\frac{1}{3}$ $5\frac{2}{3}$	$9\frac{1}{8}$ $3\frac{5}{8}$	$8\frac{1}{6}$ $1\frac{5}{6}$	$12\frac{7}{16}$ $6\frac{9}{16}$	$10\frac{7}{10}$ $8\frac{9}{10}$	$16\frac{1}{12}$ $9\frac{5}{12}$
5.	$\frac{3}{4}$ $\frac{1}{2}$	$\frac{4}{5}$ $\frac{3}{10}$	$\frac{7}{12}$ $\frac{1}{3}$	$3\frac{3}{8}$ $\frac{1}{2}$	$4\frac{5}{12}$ $\frac{5}{6}$	$1\frac{3}{16}$ $\frac{1}{4}$
6.	$5\frac{7}{8}$ $2\frac{1}{4}$	$6\frac{1}{6}$ $1\frac{1}{3}$	$13\frac{1}{4}$ $7\frac{11}{12}$	$17\frac{3}{8}$ $9\frac{11}{16}$	$10\frac{1}{10}$ $5\frac{1}{2}$	$34\frac{5}{12}$ $13\frac{5}{6}$
7.	$\frac{1}{2}$ $\frac{1}{5}$	$\frac{3}{4}$ $\frac{2}{3}$	$\frac{5}{6}$ $\frac{2}{5}$	$6\frac{1}{4}$ $\frac{4}{5}$	$5\frac{2}{3}$ $\frac{7}{8}$	$1\frac{2}{5}$ $\frac{2}{3}$
8.	$4\frac{2}{3}$ $2\frac{1}{2}$	$9\frac{1}{4}$ $7\frac{1}{3}$	$6\frac{1}{8}$ $5\frac{2}{3}$	$13\frac{2}{3}$ $9\frac{4}{5}$	$29\frac{1}{3}$ $14\frac{7}{10}$	$36\frac{1}{5}$ $27\frac{5}{6}$
9.	$\frac{3}{4}$ $\frac{1}{6}$	$\frac{7}{8}$ $\frac{5}{6}$	$\frac{7}{10}$ $\frac{1}{4}$	$4\frac{1}{6}$ $\frac{8}{9}$	$8\frac{3}{8}$ $\frac{7}{10}$	$1\frac{3}{10}$ $\frac{5}{6}$
10.	$8\frac{3}{4}$ $5\frac{1}{10}$	$3\frac{1}{10}$ $1\frac{1}{8}$	$11\frac{5}{6}$ $4\frac{9}{10}$	$9\frac{1}{12}$ $8\frac{5}{8}$	$12\frac{3}{4}$ $5\frac{5}{6}$	$24\frac{1}{6}$ $19\frac{7}{8}$

KEEPING THE TOOLS SHARP

Multiply. Check each answer.

1.	$8 \times \frac{1}{3}$	$3 \times \frac{2}{5}$	$7 \times \frac{5}{8}$	$9 \times \frac{3}{4}$
2.	$4 \times \frac{9}{10}$	$12 \times \frac{3}{8}$	$10 \times \frac{9}{16}$	$14 \times \frac{5}{12}$
3.	$12 \times \frac{2}{3}$	$18 \times \frac{5}{6}$	$20 \times \frac{4}{5}$	$32 \times \frac{13}{16}$
4.	$2 \times \frac{2}{5}$	$5 \times \frac{3}{16}$	$2 \times \frac{3}{10}$	$4 \times \frac{3}{16}$
5.	$\frac{2}{3} \times 15$	$\frac{5}{16} \times 32$	$\frac{7}{8} \times 24$	$\frac{7}{12} \times 36$
6.	$\frac{3}{8} \times 9$	$\frac{7}{10} \times 3$	$\frac{3}{5} \times 13$	$\frac{11}{16} \times 9$
7.	$\frac{3}{4} \times 14$	$\frac{1}{6} \times 16$	$\frac{7}{8} \times 18$	$\frac{11}{12} \times 22$
8.	$\frac{4}{9} \times 2$	$\frac{3}{10} \times 3$	$\frac{5}{16} \times 2$	$\frac{1}{6} \times 2$
9.	$5\frac{1}{3}$ × 4	$6\frac{1}{2}$ × 3	$7\frac{3}{8}$ × 5	$11\frac{7}{10}$ × 7	$12\frac{3}{4}$ × 9
10.	$8\frac{3}{10}$ × 6	$10\frac{2}{3}$ × 9	$13\frac{5}{6}$ × 8	$14\frac{11}{12}$ × 10	$17\frac{5}{16}$ × 12
11.	$7\frac{1}{2}$ × 4	$18\frac{3}{10}$ × 10	$21\frac{1}{4}$ × 8	$15\frac{3}{4}$ × 12	$16\frac{2}{5}$ × 15
12.	9 × $2\frac{1}{3}$	10 × $6\frac{3}{5}$	40 × $5\frac{5}{8}$	32 × $7\frac{9}{16}$	24 × $9\frac{3}{4}$
13.	7 × $4\frac{1}{2}$	11 × $3\frac{5}{6}$	13 × $9\frac{7}{10}$	25 × $8\frac{2}{3}$	19 × $7\frac{5}{12}$
14.	10 × $2\frac{5}{12}$	12 × $5\frac{7}{8}$	15 × $8\frac{3}{10}$	20 × $11\frac{5}{6}$	24 × $13\frac{9}{16}$

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TABLES OF MEASURES

MEASURES OF LENGTH

12 inches (in.) = 1 foot (ft.)
3 feet (ft.) = 1 yard (yd.)
36 inches (in.) = 1 yard (yd.)
16½ feet (ft.) = 1 rod (rd.)
5½ yards (yd.) = 1 rod (rd.)
320 rods (rd.) = 1 mile (mi.)
5280 feet (ft.) = 1 mile (mi.)
1760 yards (yd.) = 1 mile (mi.)

DRY MEASURES

2 pints (pt.) = 1 quart (qt.)
8 quarts (qt.) = 1 peck (pk.)
4 pecks (pk.) = 1 bushel (bu.)

MEASURES OF WEIGHT

16 ounces (oz.) = 1 pound (lb.)
2000 pounds (lb.) = 1 Ton (T.)

LIQUID MEASURES

2½ standard measuring cups = 1 imperial pint (pt.)
(2 standard measuring cups = 1 U.S. pint)
2 pints (pt.) = 1 quart (qt.)
4 quarts (qt.) = 1 gallon (gal.)

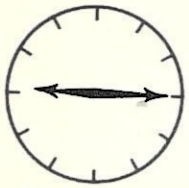
MEASURES OF TIME

60 seconds (sec.) = 1 minute (min.)
60 minutes (min.) = 1 hour (hr.)
24 hours (hr.) = 1 day (da.)
7 days (da.) = 1 week (wk.)
52 weeks (wk.) = 1 year (yr.)
12 months (mo.) = 1 year (yr.)
365 days (da.) = 1 year (yr.)
366 days (da.) = 1 leap year
10 years (yr.) = 1 decade
100 years (yr.) = 1 century

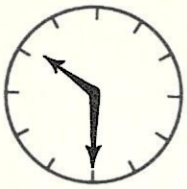
MEASURES OF AREA

144 square inches (sq. in.) = 1 square foot (sq. ft.)
9 square feet (sq. ft.) = 1 square yard (sq. yd.)

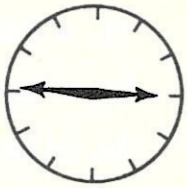
TELLING THE TIME



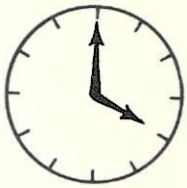
Quarter past nine
or 9.15 a.m. *and* p.m.



Half past ten
or 10.30 a.m. *and* p.m.



Quarter to three
or 2.45 a.m. *and* p.m.



Four o'clock
or 4.00 a.m. *and* p.m.

a.m. means *ante meridiem* or before noon.
p.m. means *post meridiem* or afternoon.

THE CALENDAR

Thirty days has September,
April, June and November.
All the rest have thirty-one,
Excepting February alone,
Which has twenty-eight days clear
And twenty-nine in each leap year.

ABBREVIATIONS

cwt. = hundredweight
ft. = foot
hr. = hour
in. = inch
lb. = pound
min. = minute
oz. = ounce
pt. = pint
sec. = second
st. = stone
yd. = yard

SIGNS

$+$ = add	$\times$ = multiply
$-$ = subtract	$\div$ = divide
$'$ = feet	$''$ = inches

$6(3 + 4)$ means "Multiply the sum in the brackets by 6".

$4\overline{)28}$ means "Divide 28 by 4".

$5\left(\frac{42}{6}\right)$ means "Divide 42 by 6 and multiply the answer by 5".

$3(9 - 2)$ means "Subtract 2 from 9 and multiply the answer by 3".

ADDITION BONDS

0	1	2	3	4	5	6	7	8	9
9	10	11	12	13	14	15	16	17	18
8	9	10	11	12	13	14	15	16	
7	8	9	10	11	12	13	14		
6	7	8	9	10	11	12			
5	6	7	8	9	10				
4	5	6	7	8					
3	4	5	6						
2	3	4							
1	2								

To find the sum of two numbers, look for the larger of the two numbers in the left-hand column.

EXAMPLE: Find the sum of 4 and 7.

Look for 7 in the left-hand column.
Under the heading 4 you find 11,
so $7 + 4 = 11$ and $4 + 7 = 11$.

MULTIPLICATION BONDS

1	12	11	10	9	8	7	6	5	4	3	2
2	24	22	20	18	16	14	12	10	8	6	4
3	36	33	30	27	24	21	18	15	12	9	
4	48	44	40	36	32	28	24	20	16		
5	60	55	50	45	40	35	30	25			
6	72	66	60	54	48	42	36				
7	84	77	70	63	56	49					
8	96	88	80	72	64						
9	108	99	90	81							
10	120	110	100								
11	132	121									
12	144										

To find the product of two numbers, look for the lower of the two numbers in the left-hand column.

EXAMPLE: What is the product of 9×4 ?

Look for 4 in the left-hand column.
Under the heading 9 you find 36,
so $4 \times 9 = 36$ and $9 \times 4 = 36$.

DICTIONARY

Area: The amount of surface. To find the area of a rectangle or a square, you multiply the length by the breadth. But first make sure that both of these measurements are in the same units.

Average: The average of 4, 5 and 9 is 6. To find it we add 4, 5 and 9 together and then, because there are three numbers, we divide the total by 3.

Breadth: Another word meaning "width".

Compound: Means that there is more than one part. 3 tons 50 lb. $\times$ 7 is a compound sum because it has two parts. You have to multiply the tons and the pounds.

Contain: Means to hold, or to have inside. Your ink-pot contains ink. 9 contains 3 threes.

Denominator: The bottom number of a fraction. It tells you how big the pieces are. $\frac{7}{8}$ means that you have 7 pieces and the pieces are all eighths. The figure 8 is the denominator.

Divide: When we say "9 divide by 3" the answer is 3. We find out how many times 3 is contained in 9. We could write $9 \div 3 = 3$. The $\div$ is the sign for divide.

Dividend: Something that has to be divided. $3\overline{)504}$ In this sum, the dividend is 504.

Divisor: The number you have to divide by. $8\overline{)623}$ In this sum, the divisor is 8.

Dozen: Twelve.

Fraction: Fractions are the pieces you get when you break something. If you break a bar of chocolate into 8 pieces all exactly the same, the pieces, or fractions, are called "eighths." $\frac{1}{4}$, $\frac{7}{8}$, $\frac{1}{2}$ are all fractions.

Gross: Twelve dozen, or 144.

Improper Fractions: When a fraction has a number at the top which is the same or larger than the bottom number it is an improper fraction. $\frac{7}{2}$, $\frac{4}{3}$, $\frac{19}{19}$, are improper fractions.

DICTIONARY

Lowest Terms: $\frac{4}{12}$ is exactly the same as $\frac{1}{3}$. We can say exactly the same thing using smaller numbers. When we change a fraction in this way, we reduce it to its lowest terms.

Mixed Numbers: A number which is made up partly of whole ones and partly of fractions. $4\frac{1}{4}$, $6\frac{3}{8}$, $2\frac{3}{4}$, are all mixed numbers.

Multiply: When we multiply 9 by 3 the answer is 27. We could write $9 \times 3 = 27$. The $\times$ is the sign for multiplying.

Multiplying downwards: In this little sum we do not know the 37-times table, but we do know the 6-times table, so we work the sum as if it were written the other way up. Say, "6 sevens are 42. 2 down carry 4. 6 threes are 18, and four to carry makes 22."

$$\begin{array}{r} 6 \\ \times 37 \\ \hline \end{array}$$

Perimeter: The distance all the way round. To find it you add together the lengths of all the sides. Sometimes there is an easier way.

Product: The product is obtained by multiplying numbers together. The product of 4 and 3 is 12.

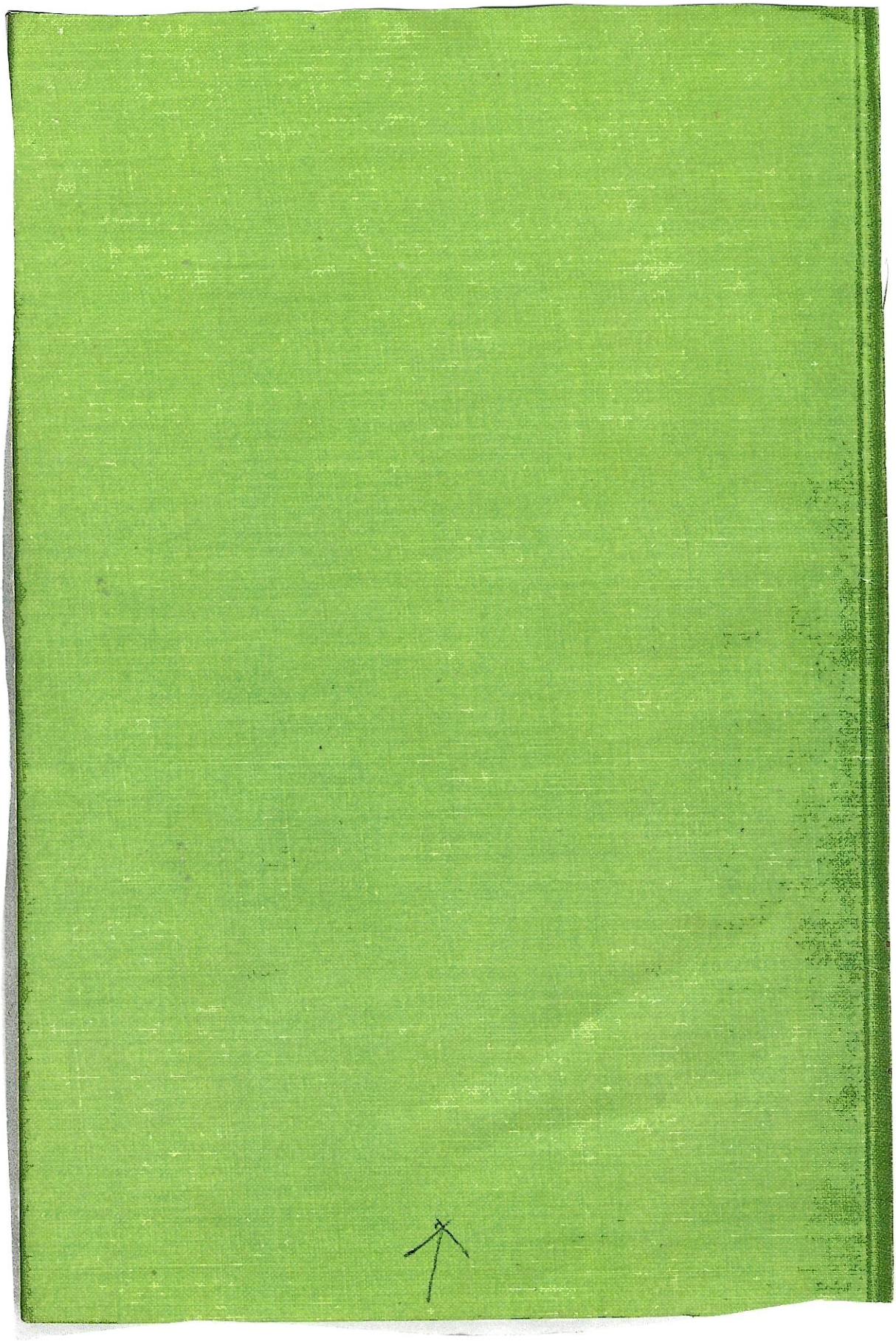
Quotient: The answer to a division sum. In this sum, the quotient is 47 and the remainder 1.

$$\begin{array}{r} 47R1 \\ \hline 3)\overline{142} \\ 1 \end{array}$$

Rectangle: A figure which has four square corners and has opposite sides equal. This page is a rectangle. When all four sides are equal, the rectangle is a square.

Score: Twenty.

Square: A figure with four square corners and all its sides equal in length.

Subtract: Take away.

Total: As a rule, when you have to find the total, you must add.